

62807

=&gt; d que 122

L3 1 SEA FILE=REGISTRY ABB=ON PLU=ON LITHIUM/CN  
 L4 336752 SEA FILE=HCAPLUS ABB=ON PLU=ON L3 OR LITHIUM#  
 L5 18585 SEA FILE=HCAPLUS ABB=ON PLU=ON "BATTERY ANODES"+PFT,NT/CT  
  
 L6 173255 SEA FILE=HCAPLUS ABB=ON PLU=ON ANODE# OR NEGATIVE  
 ELECTROD#  
 L7 QUE ABB=ON PLU=ON L5 OR L6  
 L8 3033 SEA FILE=HCAPLUS ABB=ON PLU=ON L7 AND CURRENT COLLECT?  
 L9 1450 SEA FILE=HCAPLUS ABB=ON PLU=ON L8 AND L4  
 L10 35 SEA FILE=HCAPLUS ABB=ON PLU=ON L9 AND SURFACE(2A)ROUGH?  
 L11 33020 SEA FILE=HCAPLUS ABB=ON PLU=ON "SURFACE ROUGHNESS"+PFT,NT  
 /CT  
 L16 QUE ABB=ON PLU=ON MU OR MICRON OR MICROMETER OR MICRO  
 (W)METER OR NANOMETER OR NANO(W)METER OR NM  
 L18 13 SEA FILE=HCAPLUS ABB=ON PLU=ON L10 AND L16  
 L19 2386 SEA FILE=HCAPLUS ABB=ON PLU=ON L7 AND ANODE(2A)COLLECT?  
 L20 36 SEA FILE=HCAPLUS ABB=ON PLU=ON L19 AND (L11 OR SURFACE(2A  
 )ROUGH?)  
 L21 23 SEA FILE=HCAPLUS ABB=ON PLU=ON L20 AND L16  
 L22 29 SEA FILE=HCAPLUS ABB=ON PLU=ON L18 OR L21

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L16 QUE ABB=ON PLU=ON MU OR MICRON OR MICROMETER OR MICRO  
 (W)METER OR NANOMETER OR NANO(W)METER OR NM  
 L23 130075 SEA FILE=WPIX ABB=ON PLU=ON ANODE# OR NEGATIVE ELECTROD#  
 OR ANODE#(2A)BATTER?  
 L24 9655 SEA FILE=WPIX ABB=ON PLU=ON CURRENT COLLECT? OR ANODE#  
 COLLECT?  
 L25 3590 SEA FILE=WPIX ABB=ON PLU=ON L23 AND L24  
 L26 35 SEA FILE=WPIX ABB=ON PLU=ON L25 AND SURFACE(2A)ROUGH?  
 L27 19 SEA FILE=WPIX ABB=ON PLU=ON L26 AND L16  
 L28 17 SEA FILE=WPIX ABB=ON PLU=ON L27 AND LITHIUM#

=&gt; d que 133

L16 QUE ABB=ON PLU=ON MU OR MICRON OR MICROMETER OR MICRO  
 (W)METER OR NANOMETER OR NANO(W)METER OR NM  
 L23 130075 SEA FILE=WPIX ABB=ON PLU=ON ANODE# OR NEGATIVE ELECTROD#  
 OR ANODE#(2A)BATTER?  
 L24 9655 SEA FILE=WPIX ABB=ON PLU=ON CURRENT COLLECT? OR ANODE#  
 COLLECT?  
 L30 310 SEA FILE=COMPENDEX ABB=ON PLU=ON L23 AND L24  
 L31 6 SEA FILE=COMPENDEX ABB=ON PLU=ON L30 AND SURFACE(2A)ROUG  
 H?  
 L32 1 SEA FILE=COMPENDEX ABB=ON PLU=ON L31 AND L16  
 L33 6 SEA FILE=COMPENDEX ABB=ON PLU=ON L31 OR L32

=&gt; d que 135

L16 QUE ABB=ON PLU=ON MU OR MICRON OR MICROMETER OR MICRO  
 (W)METER OR NANOMETER OR NANO(W)METER OR NM  
 L23 130075 SEA FILE=WPIX ABB=ON PLU=ON ANODE# OR NEGATIVE ELECTROD#  
 OR ANODE#(2A)BATTER?  
 L24 9655 SEA FILE=WPIX ABB=ON PLU=ON CURRENT COLLECT? OR ANODE#  
 COLLECT?  
 L30 310 SEA FILE=COMPENDEX ABB=ON PLU=ON L23 AND L24  
 L34 26 SEA FILE=JAPIO ABB=ON PLU=ON L30 AND SURFACE(2A)ROUGH?

10/691,476

L35 13 SEA FILE=JAPIO ABB=ON PLU=ON L34 AND L16

=> d que 136

L16 QUE ABB=ON PLU=ON MU OR MICRON OR MICROMETER OR MICRO  
(W)METER OR NANOMETER OR NANO(W)METER OR NM  
L23 130075 SEA FILE=WPIX ABB=ON PLU=ON ANODE# OR NEGATIVE ELECTROD#  
OR ANODE#(2A)BATTER?  
L24 9655 SEA FILE=WPIX ABB=ON PLU=ON CURRENT COLLECT? OR ANODE#  
COLLECT?  
L30 310 SEA FILE=COMPENDEX ABB=ON PLU=ON L23 AND L24  
L34 26 SEA FILE=JAPIO ABB=ON PLU=ON L30 AND SURFACE(2A)ROUGH?  
L36 0 SEA FILE=PASCAL ABB=ON PLU=ON L34 AND L16

=> dup rem 122 128 133 135,136

L36 HAS NO ANSWERS

FILE 'HCAPLUS' ENTERED AT 10:25:58 ON 28 JUN 2007  
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FILE 'WPIX' ENTERED AT 10:25:58 ON 28 JUN 2007  
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FILE 'COMPENDEX' ENTERED AT 10:25:58 ON 28 JUN 2007  
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FILE 'JAPIO' ENTERED AT 10:25:58 ON 28 JUN 2007  
COPYRIGHT (C) 2007 Japanese Patent Office (JPO)- JAPIO  
PROCESSING COMPLETED FOR L22  
PROCESSING IS APPROXIMATELY 5% COMPLETE FOR L28  
PROCESSING COMPLETED FOR L28  
PROCESSING COMPLETED FOR L33  
PROCESSING COMPLETED FOR L35  
PROCESSING COMPLETED FOR L36

L38 63 DUP REM L22 L28 L33 L35 L36 (2 DUPLICATES REMOVED)  
ANSWERS '1-29' FROM FILE HCAPLUS  
ANSWERS '30-44' FROM FILE WPIX  
ANSWERS '45-50' FROM FILE COMPENDEX  
ANSWERS '51-63' FROM FILE JAPIO

=> d 1-29 ibib ed abs hitstr hitind

L38 ANSWER 1 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN DUPLICATE 1  
ACCESSION NUMBER: 2007:90768 HCAPLUS Full-text  
DOCUMENT NUMBER: 146:187504  
TITLE: Battery  
INVENTOR(S): Kawase, Kenichi; Konishiike, Isamu; Iwama,  
Masayuki; Hirose, Takakazu  
PATENT ASSIGNEE(S): Japan  
SOURCE: U.S. Pat. Appl. Publ., 14pp.  
CODEN: USXXCO  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 1

## PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2007020523	A1	20070125	US 2006-457027	20060712
JP 2007027008	A	20070201	JP 2005-210622	20050720
CN 1901269	A	20070124	CN 2006-10106185	20060720
PRIORITY APPLN. INFO.:			JP 2005-210622	A 20050720

ED Entered STN: 26 Jan 2007

AB A battery capable of improving cycle characteristics is provided. An **anode** contains Si as an element. Where the Li insertion amount per unit area when the **anode** is fully charged is A, the Li amount capable of being electronically inserted per unit area of the **anode** is B, and the maximum utilization ratio C% is  $(A/B)+100$ , the maximum utilization ratio C% is in the range from 35% to 85%. The **surface roughness** Ra value of the **anode current collector** is 0.2  $\mu\text{m}$  or more.

INCL 429218100; 429231950; 429200000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST battery **anode** siliconIT **Battery anodes**

Battery electrolytes

**Surface roughness**(battery with silicon **anode**)

IT Secondary batteries

(lithium; battery with silicon **anode**)

IT 26748-41-4, tert-Butylperoxyneodecanoate

(battery with silicon **anode**)

IT 96-49-1, Ethylene carbonate 616-38-6, Dimethyl carbonate  
 7440-21-3, Silicon, uses 7440-50-8, Copper, uses 12190-79-3,  
 Cobalt **lithium** oxide (CoLiO<sub>2</sub>) 21324-40-3, **Lithium**  
 hexafluorophosphate 67783-83-9, Neopentylglycol diacrylate-  
 trimethylolpropane triacrylate copolymer 114435-02-8,  
 4-Fluoro-1,3-dioxolan-2-one  
 (battery with silicon **anode**)

L38 ANSWER 2 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN DUPLICATE 2

ACCESSION NUMBER: 2004:632524 HCAPLUS Full-text

DOCUMENT NUMBER: 141:176847

TITLE: Manufacture of **lithium** secondary battery  
using laser welding

INVENTOR(S): Otsubo, Shinji

PATENT ASSIGNEE(S): NGK Insulators, Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 28 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2004220953	A	20040805	JP 2003-7921	20030116
PRIORITY APPLN. INFO.:			JP 2003-7921	20030116

ED Entered STN: 06 Aug 2004

AB Disclosed is the process comprising a laser welding of the surface of the pos.  
 (neg.) **electrode current collector** having a sp. **surface roughness** (Ra = 0.05-  
 6.3  $\mu\text{m}$ ) with the pos.(neg.) **electrode** plate using a laser such as a YAG laser

having a power d.  $\geq 5$  kW/mm<sup>2</sup>. The invention aims at the Li secondary battery used for an elec. car and a hybrid car.

IC ICM H01M002-26  
ICS H01M002-22; H01M010-40  
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
ST **lithium** secondary battery laser welding  
IT Electric vehicles  
(automobiles; manufacture of **lithium** secondary battery using laser welding)  
IT Automobiles  
(elec.; manufacture of **lithium** secondary battery using laser welding)  
IT Welding of metals  
(laser; manufacture of **lithium** secondary battery using laser welding)  
IT Secondary batteries  
(**lithium**; manufacture of **lithium** secondary battery using laser welding)

L38 ANSWER 3 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2007:284049 HCAPLUS Full-text  
DOCUMENT NUMBER: 146:299308  
TITLE: **Current collector, anode, and secondary battery**  
INVENTOR(S): Kato, Yoshikazu  
PATENT ASSIGNEE(S): Sony Corp., Japan  
SOURCE: Jpn. Kokai Tokkyo Koho, 14pp.  
CODEN: JKXXAF  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2007066633	A	20070315	JP 2005-249597	20050830
PRIORITY APPLN. INFO.:			JP 2005-249597	20050830

ED Entered STN: 16 Mar 2007

AB The collector has a polymer layer comprising a polymer compound on a conductive substrate; where the **surface roughness** (Rz) of the substrate is 3-12  $\mu\text{m}$ , and the ratio of the thickness of the polymer layer to the Rz of the substrate is  $\leq 2/3$ . The **anode** has an **anode** active mass layer on the above collector. The battery has the above **anode**, a cathode, and an electrolyte solution

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
ST secondary battery **anode collector surface roughness** polymer layer thickness  
IT **Battery anodes**  
Secondary batteries  
(**anode collectors** containing polymer compound layers on conductive substrates for secondary **lithium** batteries)  
IT Fluoropolymers, uses  
(**anode collectors** containing polymer compound layers on conductive substrates for secondary **lithium** batteries)  
IT Electric **current**  
(**collector; anode collectors** containing polymer compound layers on conductive substrates for secondary **lithium** batteries)

IT 24937-79-9, PVDF

(**anode collectors** containing polymer compound layers  
on conductive substrates for secondary **lithium** batteries)

IT 7440-21-3, Silicon, uses 7440-50-8, Copper, uses 12190-79-3,  
Cobalt **lithium** oxide (CoLiO<sub>2</sub>)

(**anode collectors** containing polymer compound layers  
on conductive substrates for secondary **lithium** batteries)

L38 ANSWER 4 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2007:223692 HCAPLUS Full-text

DOCUMENT NUMBER: 146:255409

TITLE: Manufacture of **lithium** secondary battery  
electrodes suppressing wrinkling on  
charge-discharge cycle

INVENTOR(S): Nagao, Nobuaki; Mino, Shinji; Ukaji, Masaya;  
Takahashi, Keiichi

PATENT ASSIGNEE(S): Matsushita Electric Industrial Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 10pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 2007052960	A	20070301	JP 2005-236269	20050817
PRIORITY APPLN. INFO.:			JP 2005-236269	20050817

ED Entered STN: 01 Mar 2007

AB The electrodes are manufactured by coating sheet-type **current collectors** having plural protrusions (A) on surface, with interlayers compatible with electrolytic liqs., removing the interlayer surface to expose A partially, and arranging active mass layers on the exposed A. The **current collectors** may satisfy **surface roughness** Ra 1-3 . $\mu$  m. The electrodes have spaces for relaxation of swelling/shrinking on charge-discharge cycle and suppress wrinkle formation.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST interlayer buried **current collector** battery  
electrode; swelling shrinking absorption space battery electrode  
wrinkling prevention; charge discharge cycle resistance  
**lithium** battery electrode

IT Carbonates, uses

Polycarbonates, uses

(interlayers; manufacture of **lithium** secondary battery  
electrodes forming active masses on protruded **current**  
**collector** sections exposed from interlayers)

IT Secondary batteries

(**lithium**; manufacture of **lithium** secondary battery  
electrodes forming active masses on protruded **current**  
**collector** sections exposed from interlayers)

IT Battery electrodes

(manufacture of **lithium** secondary battery electrodes forming  
active masses on protruded **current collector**  
sections exposed from interlayers)

IT Silicon alloy, base

(active-mass layers; manufacture of **lithium** secondary battery  
electrodes forming active masses on protruded **current**  
**collector** sections exposed from interlayers)

IT Copper alloy, base

(**current collectors**; manufacture of **lithium** secondary battery electrodes forming active masses on protruded **current collector** sections exposed from interlayers)

- IT 7440-21-3, Silicon, uses 7631-86-9, Silica, uses (active-mass layers; manufacture of **lithium** secondary battery electrodes forming active masses on protruded **current collector** sections exposed from interlayers)
- IT 129737-53-7, Silicon oxide (SiO<sub>2</sub>.3) (**anode** active mass; manufacture of **lithium** secondary battery electrodes forming active masses on protruded **current collector** sections exposed from interlayers)
- IT 7440-50-8, Copper, uses (**current collectors**; manufacture of **lithium** secondary battery electrodes forming active masses on protruded **current collector** sections exposed from interlayers)
- IT 105-58-8, Diethyl carbonate 21324-40-3, **Lithium** hexafluorophosphate (electrolytic solns.; manufacture of **lithium** secondary battery electrodes forming active masses on protruded **current collector** sections exposed from interlayers)
- IT 96-49-1, Ethylene carbonate (interlayers; manufacture of **lithium** secondary battery electrodes forming active masses on protruded **current collector** sections exposed from interlayers)

L38 ANSWER 5 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2007:116660 HCAPLUS Full-text

DOCUMENT NUMBER: 146:209691

TITLE: **Anode** for secondary batteries, and the battery using the **anode**

INVENTOR(S): Yamamoto, Hironori; Miyaji, Mariko; Shirakata, Masato

PATENT ASSIGNEE(S): Nec Corp., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 23pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 2007026805	A	20070201	JP 2005-205423	20050714
PRIORITY APPLN. INFO.: ~			JP 2005-205423	20050714

ED Entered STN: 02 Feb 2007

AB The **anode** has an **anode** active mass layer on a collector; where the collector has a **surface roughness** 2-15  $\mu$ m on the **anode** active mass layer side, and the **anode** active mass layer contains a Li nonintercalating element and  $\geq 1$  **anode** active mass selected from Li-intercalating metals, metalloids, and their oxides.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST secondary battery **anode collector surface roughness** lithium nonintercalating element

IT **Battery anodes**

(structure of **anodes** for secondary batteries)

IT 7429-90-5, Aluminum, uses 7439-89-6, Iron, uses 7439-92-1, Lead,

uses 7440-22-4, Silver, uses 11136-12-2, Iron 10, silicon 90  
 (atomic) 21651-19-4, Tin oxide (SnO) 70797-67-0, Cobalt 30, tin 70  
 (atomic) 71818-44-5 71894-68-3, Nickel 50, silicon 50 (atomic)  
 113443-18-8, Silicon oxide (SiO) 128215-16-7, Nickel 30, tin 70  
 (atomic) 142296-33-1, Iron 90, silver 10 (atomic) 586417-44-9  
 (structure of **anodes** for secondary batteries)

L38 ANSWER 6 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2006:790663 HCAPLUS Full-text

DOCUMENT NUMBER: 145:192032

TITLE: **Anode** and secondary nonaqueous electrolyte battery using the **anode**

INVENTOR(S): Inoue, Takao; Kanai, Kumiko; Itaya, Masaharu; Fujimoto, Masahisa

PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan

SOURCE: PCT Int. Appl., 30pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2006082722	A1	20060810	WO 2006-JP300883	20060120
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
JP 2006244976	A	20060914	JP 2005-167001	20050607
PRIORITY APPLN. INFO.:			JP 2005-30891	A 20050207
			JP 2005-167001	A 20050607

ED Entered STN: 10 Aug 2006

AB The **anode** has a Sn or Ge thin film formed on a metal collector. The battery has the above **anode**, a cathode, and a Na+-containing nonaq. electrolyte. Preferably, the **anode collector** comprised a rough-surfaced Cu and has an average **surface roughness** 0.1-10  $\mu\text{m}$ .

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST secondary battery **anode** tin germanium **collector** copper

IT **Battery anodes**

Secondary batteries

(**anodes** containing tin or germanium for secondary batteries)

IT 7440-50-8, Copper, uses 7440-56-4, Germanium, uses 56127-36-7, Manganese sodium oxide

(**anodes** containing tin or germanium for secondary batteries)

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L38 ANSWER 7 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2006:489357 HCAPLUS Full-text  
 DOCUMENT NUMBER: 144:491871  
 TITLE: **Anode** and battery  
 INVENTOR(S): Konishiike, Isamu; Kawase, Kenichi  
 PATENT ASSIGNEE(S): Japan  
 SOURCE: U.S. Pat. Appl. Publ., 16 pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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US 2006110662	A1	20060525	US 2005-280703	20051116
JP 2006155959	A	20060615	JP 2004-341183	20041125
KR 2006058761	A	20060530	KR 2005-112677	20051124
CN 1783553	A	20060607	CN 2005-10126878	20051125
PRIORITY APPLN. INFO.:			JP 2004-341183	A 20041125

ED Entered STN: 25 May 2006

AB An **anode** capable of improving cycle characteristics and a battery using it are provided. An **anode** active material layer containing Si is provided on an **anode current collector**. The **anode current collector** is roughened by providing a projection on a base material with a ten point height of roughness profile Rz1 of 2.0 .  $\mu$ m or less. A value of a difference, Rz2-Rz1 obtained by subtracting the ten point height of roughness profile Rz1 of the base material from a ten point height of roughness profile Rz2 of the **anode current collector** is from 0.2 .  $\mu$ m to 5.1  $\mu$ m. Thereby, even when the **anode** active material is expanded and shrunk due to charge and discharge, breakage of the **anode current collector**, fall off of the **anode** active material layer and the like can be prevented.

INCL 429233000; 429218100

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST battery **anode**

IT **Battery anodes**

Secondary batteries

Sputtering

**Surface roughness**

(battery **anodes**)

IT Fluoropolymers, uses

(battery **anodes**)

IT Electron beams

(vacuum vapor deposition; battery **anodes**)

IT Vapor deposition process

(vacuum, electron beam; battery **anodes**)

IT 7440-21-3, Silicon, uses 7440-50-8, Copper, uses 12190-79-3,

Cobalt lithium oxide (CoLiO<sub>2</sub>)

(battery **anodes**)

IT 24937-79-9, Pvd

(battery **anodes**)

L38 ANSWER 8 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2006:1066066 HCAPLUS Full-text

DOCUMENT NUMBER: 145:380463

TITLE: Lithium secondary battery equipped with coiled electrode

INVENTOR(S): Okutani, Eiji; Morimoto, Takaya

PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan



10/691,476

SOURCE: Jpn. Kokai Tokkyo Koho, 11pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2006278143	A	20061012	JP 2005-95584	20050329
PRIORITY APPLN. INFO.:			JP 2005-95584	20050329

ED Entered STN: 13 Oct 2006

AB The coiled electrode has a flat electrode region formed by pressing and brought into contact with an electrode core, e.g., a metal foil, where the electrode **surface** is **roughened** to pitch (Sm)  $\leq 50 \mu\text{m}$  and directly laminated to the separator. The battery has simple structure and is suppressed from deformation.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST lithium secondary battery coiled electrode metal foil **surface roughness**

IT **Battery anodes**

**Surface roughness**

(electrode core/separator **surface roughness**

pitch in coiled electrode for lithium secondary battery)

IT Secondary batteries

(lithium; electrode core/separator **surface**

**roughness** pitch in coiled electrode for lithium secondary battery)

IT 7782-42-5, Graphite, uses

(**anode**; electrode core/separator **surface**

**roughness** pitch in coiled electrode for lithium secondary battery)

IT 7440-50-8, Copper, uses

(foil, **anode collector**; electrode

core/separator **surface roughness** pitch in coiled electrode for lithium secondary battery)

IT 9003-07-0, Polypropylene

(separator; electrode core/separator **surface**

**roughness** pitch in coiled electrode for lithium secondary battery)

L38 ANSWER 9 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2006:655487 HCAPLUS Full-text

DOCUMENT NUMBER: 145:86624

TITLE: Button-type alkaline batteries employing mercury- and lead-free zinc alloy **anodes**

INVENTOR(S): Ono, Michiko; Ida, Kiyoto

PATENT ASSIGNEE(S): Toshiba Battery Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 12 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2006179227	A	20060706	JP 2004-369548	20041221
PRIORITY APPLN. INFO.:			JP 2004-369548	20041221

ED Entered STN: 07 Jul 2006

AB The batteries comprise cathode containers, gel **anodes** containing Hg- and Pb-free Zn alloys and alkaline electrolytes, **anode** containers working as **anode** current **collectors**, and elec. insulating gaskets disposed between the edge of the **anode** containers and cathode containers, wherein inner surfaces and the edges of the **anode** containers are plated with Sn and/or In, and the **surface roughness** (Ra) of the edges are adjusted to  $\leq 0.3 \mu\text{m}$ . The structure inhibits leakage of electrolyte solns. due to improved fitness between the gaskets and **anode** container edges.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST button type alk battery **anode** container edge **surface roughness**; tin plating **anode** container button alk battery; indium plating **anode** container button alk battery

IT Primary batteries

**Surface roughness**

(Hg- and Pb-free button-type alkaline battery having **anode** container with smooth surface at edge)

IT **Battery anodes**

(containers; Hg- and Pb-free button-type alkaline battery having **anode** container with smooth surface at edge)

IT 7440-50-8, Copper, uses

(innermost surface of multilayer **anode** container, with surface smoothness; Hg- and Pb-free button-type alkaline battery having **anode** container with smooth surface at edge)

IT 7440-66-6, Zinc, uses

(microalloyed, **anode**; Hg- and Pb-free button-type alkaline battery having **anode** container with smooth surface at edge)

IT 7440-31-5, Tin, uses 7440-74-6, Indium, uses

(plating on inner surface and edge of **anode** container; Hg- and Pb-free button-type alkaline battery having **anode** container with smooth surface at edge)

L38 ANSWER 10 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2006:237639 HCAPLUS Full-text

DOCUMENT NUMBER: 144:295915

TITLE: Secondary nonaqueous-electrolyte batteries with **anodes** containing carbon and silicon and their manufacture

INVENTOR(S): Yamate, Shigeki

PATENT ASSIGNEE(S): Js Yuasa Crop., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 11 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 2006073480	A	20060316	JP 2004-258821	20040906
PRIORITY APPLN. INFO.:			JP 2004-258821	20040906

ED Entered STN: 17 Mar 2006

AB The title batteries are equipped with **anodes** having C particle-containing layers (CPL) on **current collectors** and Si- or Si compound-containing layers (SCL) formed on CPL, where CPL are characterized by **surface roughness** Ra 0.3-9.0  $\mu\text{m}$  at the SCL side. The title process comprises forming CPL on **anode**

**collectors** to show Ra 0.3-9.0  $\mu\text{m}$  and then forming SCL. The batteries provide long cycle life.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST carbon silicon **anode** secondary nonaq battery

IT Secondary batteries

(**lithium**; manufacture of secondary nonaq.-electrolyte batteries with **anodes** containing carbon layer and silicon layer)

IT **Battery anodes**

(manufacture of secondary nonaq.-electrolyte batteries with **anodes** containing carbon layer and silicon layer)

IT 7440-21-3, Silicon, uses 7440-44-0, Carbon, uses  
(manufacture of secondary nonaq.-electrolyte batteries with **anodes** containing carbon layer and silicon layer)

L38 ANSWER 11 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2005:1078029 HCAPLUS Full-text

DOCUMENT NUMBER: 143:350012

TITLE: **Lithium** secondary battery

INVENTOR(S): Yoshida, Toshikazu; Kamino, Manio

PATENT ASSIGNEE(S): Japan

SOURCE: U.S. Pat. Appl. Publ., 11 pp.

CODEN: USXXCO

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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US 2005221189	A1	20051006	US 2005-91942	20050329
JP 2005285651	A	20051013	JP 2004-100359	20040330
CN 1677717	A	20051005	CN 2005-10062777	20050330
KR 2006045145	A	20060516	KR 2005-26435	20050330
PRIORITY APPLN. INFO.:			JP 2004-100359	A 20040330

ED Entered STN: 07 Oct 2005

AB A **lithium** secondary battery includes a **neg. electrode**, a pos. electrode, and a non-aqueous electrolyte. The **neg. electrode** includes a **neg. electrode current collector** having an irregular surface and a **neg. electrode** active material layer formed on the surface. In the **lithium** secondary battery, the **neg. electrode** active material layer is composed of a material that alloys with Li; thickness of the **neg. electrode** active material layer ( $\mu\text{m}$ )/10-point mean **surface roughness** of the **neg. electrode current collector** ( $\mu\text{m}$ ) is in the range of from 0.5 to 4; and tensile strength of the **neg. electrode current collector** (N/mm<sup>2</sup>) at 25° + the **neg. electrode current collector** base thickness (mm)/thickness of the **neg. electrode** active material layer ( $\mu\text{m}$ ) on one side of **current collector** is 2 or greater.

IC ICM H01M004-40

ICS H01M004-70; H01M004-58

INCL 429231950; 429233000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **lithium** secondary battery

IT Secondary batteries

(**lithium**; **lithium** secondary battery)

IT Copper alloy, base

(**lithium** secondary battery)

IT 7440-21-3, Silicon, uses

(**lithium** secondary battery)

L38 ANSWER 12 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2005:450172 HCAPLUS Full-text  
 DOCUMENT NUMBER: 142:484820  
 TITLE: Secondary nonaqueous electrolyte battery  
 INVENTOR(S): Hatanaka, Chizuru; Sato, Asako; Matsumoto, Koichi;  
 Endo, Shota; Sato, Kazuya  
 PATENT ASSIGNEE(S): Toshiba Corp., Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 11 pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2005135826	A	20050526	JP 2003-372449	20031031
PRIORITY APPLN. INFO.:			JP 2003-372449	20031031

ED Entered STN: 27 May 2005  
 AB The battery has a cathode, an **anode**, and a nonaq. electrolyte solution; where the **anode** uses a Cu foil as collector, having thickness 6-12  $\mu\text{m}$  and ten-point-average **surface roughness** (Rz) 1-2  $\mu\text{m}$ .  
 ICM H01M004-66  
 ICS H01M004-02; H01M004-62; H01M004-64; H01M010-40  
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
 ST secondary lithium battery **anode** copper **collector**  
 thickness **surface roughness**  
 IT 7782-42-5, Graphite, uses  
 (**anodes** containing copper foil collectors with controlled thickness and **surface roughness** for secondary lithium batteries)  
 IT 7440-50-8, Copper, uses  
 (**anodes** containing copper foil collectors with controlled thickness and **surface roughness** for secondary lithium batteries)

L38 ANSWER 13 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2004:272146 HCAPLUS Full-text  
 DOCUMENT NUMBER: 140:290036  
 TITLE: Secondary lithium battery  
 INVENTOR(S): Chiang, Dong-Biao  
 PATENT ASSIGNEE(S): Hitachi Maxell Ltd., Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 10 pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2004103435	A	20040402	JP 2002-264905	20020911
PRIORITY APPLN. INFO.:			JP 2002-264905	20020911

ED Entered STN: 02 Apr 2004  
 AB The battery comprises a cathode, having a Li-intercalating active mass containing cathode mixture layer on a cathode **collector**; an **anode**, having a Li-intercalating active mass containing **anode** mixture layer on an **anode collector**; and a separator, made of a microporous resin film, between the 2

electrodes; where the **anode** mixture layer has a **surface roughness** of 2-8  $\mu\text{m}$ . Preferably, the **anode** mixture contains 0.5-5 % filamentous carbon.

IC ICM H01M004-02  
ICS H01M002-16; H01M004-62; H01M010-40  
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
ST lithium secondary battery **anode surface roughness** control  
IT Carbon fibers, uses  
Fluoropolymers, uses  
(**anodes** containing mixture layers with controlled **surface roughness** for secondary lithium batteries)  
IT 7782-42-5, Graphite, uses 24937-79-9, PVDF  
(**anodes** containing mixture layers with controlled **surface roughness** for secondary lithium batteries)  
IT 12190-79-3, Cobalt lithium oxide (CoLiO<sub>2</sub>)  
(cathode; **anodes** containing mixture layers with controlled **surface roughness** for secondary lithium batteries)

L38 ANSWER 14 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2003:607897 HCAPLUS Full-text  
DOCUMENT NUMBER: 139:152309  
TITLE: Manufacture of **anode** and secondary lithium battery using the **anode**  
INVENTOR(S): Oshima, Kenichi; Ito, Hirofumi; Fukuhara, Kohei  
PATENT ASSIGNEE(S): Matsushita Electric Industrial Co., Ltd., Japan  
SOURCE: Jpn. Kokai Tokkyo Koho, 8 pp.  
CODEN: JKXXAF  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 2003223899	A	<u>20030808</u>	JP 2002-23029	20020131
PRIORITY APPLN. INFO.:			JP 2002-23029	20020131

ED Entered STN: 08 Aug 2003

AB The **anode** is manufactured by intermittently applying a paste mixture on both side of a Cu collector, drying; rolling; winding a hoop, which is cut into a designated width size, to a reel; and heating; where the both sides of the Cu foil has an average **surface roughness** of 0.1-0.4  $\mu\text{m}$ . The battery has an electrode group, containing a separator between the above **anode** and a cathode, in a battery case, a nonaq. electrolyte solution injected to the case, and a sealing plate sealing the opening of the case.

IC ICM H01M004-66  
ICS H01M004-02; H01M004-04; H01M010-40  
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
ST lithium secondary battery **anode** manuf copper **collector roughness**  
IT Secondary batteries  
(lithium; manufacture of **anodes** containing copper **collectors** with controlled **surface roughness** for secondary lithium batteries)  
IT **Battery anodes**  
(manufacture of **anodes** containing copper **collectors** with controlled **surface roughness** for secondary

lithium batteries)  
 IT 7782-42-5, Graphite, uses  
 (anode active mass; manufacture of **anodes** containing  
 copper **collectors** with controlled **surface**  
**roughness** for secondary lithium batteries)  
 IT 7440-50-8, Copper, uses  
 (manufacture of **anodes** containing copper **collectors** with  
 controlled **surface roughness** for secondary  
 lithium batteries)

L38 ANSWER 15 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2003:550631 HCAPLUS Full-text

DOCUMENT NUMBER: 139:103765

TITLE: Secondary **lithium** battery **anodes**  
 inhibiting deformation in repeated charging and  
 discharging, and same batteries

INVENTOR(S): Kusumoto, Yasuyuki; Fukui, Atsushi; Nakamura,  
 Hiroshi

PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 12 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 2003203637	A	20030718	JP 2001-401286	20011228
US 2003148185	A1	20030807	US 2002-329571	20021227
US 6946223	B2	20050920		
PRIORITY APPLN. INFO.:			JP 2001-401286	A 20011228

ED Entered STN: 18 Jul 2003

AB The **anodes** comprise **anode** active mass capable of alloying with Li, and **current**  
**collectors** with proportional limit  $\geq 2.0$  N/mm. Alternatively, the **anodes** are  
 prepared by applying active mass containing Si-containing substances, elec.  
 conductive carbon materials, and binders on the surface of **current collectors**,  
 and sintering in nonoxidizing atmospheric; wherein the arithmetic mean  
 roughness (Ra) of the **current collector** surface is  $\geq 0.2$   $\mu\text{m}$ , the thickness  
 (X  $\mu\text{m}$ ) of the active mass layer satisfies  $[250 \geq (X/Ra)]$ , and the contents of  
 the carbon materials and binders in the active mass are of 0.5-30 weight% and  
 5-40 weight%, resp. The **anode** active mass layer show high and durable  
 adhesion with the **current collectors** and inhibits deformation in the repeated  
 charging-discharging cycling.

IC ICM H01M004-66

ICS H01M004-02; H01M004-38; H01M004-62; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **lithium battery anode current**  
**collector surface roughness**; stress strain  
 relationship **lithium battery anode current**  
**collector**; silicon **anode lithium battery**  
**current collector**; copper **current**  
**collector lithium battery anode**; sintering  
**lithium battery anode** active mass

IT Fluoropolymers, uses  
 (binder in **anodes**; secondary Li battery **anodes**  
 containing **current collectors** with prescribed  
**surface roughness** or stress-strain relationships)

- IT Polyimides, uses  
(binder in **anodes**; secondary Li battery **anodes** containing **current collectors** with prescribed **surface roughness** or stress-strain relationships)
- IT Carbon black, uses  
(elec. conductive agents in **anodes**; secondary Li battery **anodes** containing **current collectors** with prescribed **surface roughness** or stress-strain relationships)
- IT Secondary batteries  
(**lithium**; secondary Li battery **anodes** containing **current collectors** with prescribed **surface roughness** or stress-strain relationships)
- IT Sintering  
(of **anode** active mass; secondary Li battery **anodes** containing **current collectors** with prescribed **surface roughness** or stress-strain relationships)
- IT Stress-strain relationship  
**Surface roughness**  
(of **current collectors** in **anodes**; secondary Li battery **anodes** containing **current collectors** with prescribed **surface roughness** or stress-strain relationships)
- IT **Battery anodes**  
(secondary Li battery **anodes** containing **current collectors** with prescribed **surface roughness** or stress-strain relationships)
- IT Copper alloy, base  
(**current collectors** in **anodes**; secondary Li battery **anodes** containing **current collectors** with prescribed **surface roughness** or stress-strain relationships)
- IT 7440-21-3, Silicon, uses  
(**anode** active mass; secondary Li battery **anodes** containing **current collectors** with prescribed **surface roughness** or stress-strain relationships)
- IT 24937-79-9, Polyvinylidene fluoride  
(binder in **anodes**; secondary Li battery **anodes** containing **current collectors** with prescribed **surface roughness** or stress-strain relationships)
- IT 7440-50-8, Copper, uses  
(**current collectors** in **anodes**; secondary Li battery **anodes** containing **current collectors** with prescribed **surface roughness** or stress-strain relationships)

L38 ANSWER 16 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2002:185500 HCAPLUS Full-text

DOCUMENT NUMBER: 136:203108

TITLE: Secondary lithium battery **anode** and its manufacture

INVENTOR(S): Fukui, Atsushi; Hashimoto, Takuya; Kusumoto, Yasuyuki; Nakamura, Hiroshi; Fujimoto, Masahisa; Fujitani, Shin

PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan

SOURCE: PCT Int. Appl., 55 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

## PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2002021616	A1	20020314	WO 2001-JP7519	20010831
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
JP 2002075332	A	20020315	JP 2000-265900	20000901
JP 2002260637	A	20020913	JP 2001-254261	20010824
AU 200182569	A	20020322	AU 2001-82569	20010831
CA 2420104	A1	20030210	CA 2001-2420104	20010831
EP 1335438	A1	20030813	EP 2001-961241	20010831
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR				
US 2004043294	A1	20040304	US 2003-363039	20030228
HK 1059149	A1	20070525	HK 2004-101959	20040317
PRIORITY APPLN. INFO.:			JP 2000-265900	A 20000901
			JP 2000-265901	A 20000901
			JP 2000-401501	A 20001228
			JP 2001-254261	A 20010824
			WO 2001-JP7519	W 20010831

ED Entered STN: 15 Mar 2002

AB The **anode** has a Si and/or Si alloy active mass particle layer, containing a conductive metal powder, sintered in a conductive collector foil, having a **surface roughness**  $Ra \geq 0.2 \mu m$ , and is prepared by sintering in a nonoxidizing atmospheric The collector is preferably a Cu foil.

IC ICM H01M004-02

ICS H01M004-62; H01M004-38; H01M004-04; H01M010-40; H01M004-66

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST secondary lithium battery silicon **anode** copper  
**collector** roughness

IT Fluoropolymers, uses

(binders in manufacture of sintered silicon based **anodes** on  
 copper **collectors** with controlled roughness for secondary  
 lithium batteries)

IT Sintering

(sintering in manufacture of silicon based **anodes** on copper  
**collectors** with controlled roughness for secondary lithium  
 batteries)

IT Battery anodes

(structure and manufacture of sintered silicon based **anodes** on  
 copper **collectors** with controlled roughness for secondary  
 lithium batteries)

IT 24937-79-9, Poly(vinylidene fluoride)

(binders in manufacture of sintered silicon based **anodes** on  
 copper **collectors** with controlled roughness for secondary



lithium batteries)

IT 7439-89-6, Iron, uses 7439-98-7, Molybdenum, uses 7440-02-0, Nickel, uses 7440-32-6, Titanium, uses 7440-33-7, Tungsten, uses 7440-48-4, Cobalt, uses 7440-66-6, Zinc, uses 60841-07-8 (manufacture of conductive powder containing sintered silicon based **anodes** on copper **collectors** with controlled roughness for secondary lithium batteries)

IT 7440-50-8, Copper, uses (structure and manufacture of sintered silicon based **anodes** on copper **collectors** with controlled roughness for secondary lithium batteries)

IT 7440-21-3, Silicon, uses 12645-63-5 166259-81-0 (structure and manufacture of sintered silicon based **anodes** on copper **collectors** with controlled roughness for secondary lithium batteries)

REFERENCE COUNT: 17 THERE ARE 17 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L38 ANSWER 17 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2002:388548 HCAPLUS Full-text

DOCUMENT NUMBER: 136:372267

TITLE: **Anode** containing tin-indium alloy film for secondary lithium battery

INVENTOR(S): Tamura, Nobuyuki; Jito, Taizo; Oshita, Ryuji; Fujimoto, Masahisa; Kamino, Maruo; Fujitani, Noboru

PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 5 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2002151056	A	20020524	JP 2000-346984	20001114
US 2002086215	A1	20020704	US 2001-987167	20011113
US 6746801	B2	20040608		
PRIORITY APPLN. INFO.:			JP 2000-346984	A 20001114

ED Entered STN: 24 May 2002

AB The title **anode** comprises an alloy film containing Sn and In formed on a **current collector** having **surface roughness** Ra  $\geq 0.1 \mu\text{m}$ . A secondary Li battery equipped with the **anode** is also claimed. The battery has high discharge capacity and long cycle life.

IC ICM H01M004-02

ICS H01M004-38; H01M004-66; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST tin indium alloy film **anode current collector** lithium battery

IT **Battery anodes**

(**anode** containing tin-indium alloy film on **current collector** for secondary lithium battery)

IT Secondary batteries

(**lithium; anode** containing tin-indium alloy film on **current collector** for secondary lithium battery)

IT 11124-13-3

(**anode** containing tin-indium alloy film on **current collector** for secondary **lithium** battery)

IT 7440-50-8, Copper, uses  
(foil, **current collector**; **anode**  
containing tin-indium alloy film on **current collector**  
for secondary **lithium** battery)

L38 ANSWER 18 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2001:360318 HCAPLUS Full-text  
DOCUMENT NUMBER: 134:355474  
TITLE: Battery electrodes including particles of specific sizes  
INVENTOR(S): Buckley, James P.; Ghantous, Dania I.; Hoang, Khanh; Horne, Craig R.; Bi, Xiangxin  
PATENT ASSIGNEE(S): Nanogram Corporation, USA  
SOURCE: PCT Int. Appl., 78 pp.  
CODEN: PIXXD2  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 30  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2001035473	A1	20010517	WO 2000-US30543	20001106
W: CN, IN, JP, KR				
RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR				
EP 1249047	A1	20021016	EP 2000-979141	20001106
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI, CY, TR				
JP 2003514353	T	20030415	JP 2001-537112	20001106
TW 488100	B	20020521	TW 2000-89123615	20001108
CN 1531480	A	20040922	CN 2001-820305	20011026
IN 2002CN00738	A	20070223	IN 2002-CN738	20020520
PRIORITY APPLN. INFO.:			US 1999-435748	A 19991108
			US 2000-243491P	P 20001026
			WO 2000-US30543	W 20001106

ED Entered STN: 18 May 2001

AB Embodiments of electrodes include a collection of particles having an average diameter less than about 100 nm and have a root mean square **surface roughness** less than about one **micron**. Electrodes can be formed with a collection of electroactive nanoparticles having a narrow particle size distribution. Electrodes can be formed having an average thickness less than about 10 .mu .m that include particles having an average diameter less than about 100 nm. Thin electrodes can be used in the formation of thin batteries in which at least one of the electrodes includes nanoscale electroactive particles.

IT 7439-93-2, **Lithium**, uses  
(battery electrodes including particles of specific sizes)  
RN 7439-93-2 HCAPLUS  
CN Lithium (CA INDEX NAME)

IT 7439-93-2D, **Lithium**, intercalation compound, uses  
 (particles; battery electrodes including particles of specific  
 sizes)  
 RN 7439-93-2 HCAPLUS  
 CN Lithium (CA INDEX NAME)

Li

IC ICM H01M004-36  
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
 IT **Battery anodes**  
 Battery cathodes  
 Nanoparticles  
 Particle size distribution  
**Surface roughness**  
 (battery electrodes including particles of specific sizes)  
 IT **Lithium** alloy, base  
 (battery electrodes including particles of specific sizes)  
 IT 1332-29-2, Tin oxide 11099-11-9, Vanadium oxide 11105-02-5, Silver  
 vanadium oxide 11126-12-8, Iron sulfide 11126-15-1,  
**Lithium** vanadium oxide 11129-60-5, Manganese oxide  
 12612-50-9, Molybdenum sulfide 13463-67-7, Titanium oxide, uses  
 39300-70-4, **Lithium** nickel oxide 39302-37-9,  
**Lithium** titanium oxide 39457-42-6, **Lithium**  
 Manganese oxide 52627-24-4, Cobalt **lithium** oxide  
 80341-49-7, Iron **lithium** sulfide 121339-43-3,  
**Lithium** Silver vanadium oxide 160479-36-7, **Lithium**  
 tin oxide  
 (battery electrodes including particles of specific sizes)  
 IT 7439-93-2, **Lithium**, uses  
 (battery electrodes including particles of specific sizes)  
 IT 7429-90-5, Aluminum, uses 7440-50-8, Copper, uses 12597-68-1,  
 Stainless steel, uses  
 (**current collector**; battery electrodes  
 including particles of specific sizes)  
 IT 7439-93-2D, **Lithium**, intercalation compound, uses  
 (particles; battery electrodes including particles of specific  
 sizes)

REFERENCE COUNT: 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR  
 THIS RECORD. ALL CITATIONS AVAILABLE IN THE  
 RE FORMAT

L38 ANSWER 19 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2001:320266 HCAPLUS Full-text

DOCUMENT NUMBER: 134:313663

TITLE: Lithium battery **anodes** and secondary  
 lithium batteries

INVENTOR(S): Ikeda, Hiroaki; Fujimoto, Masahisa; Fujitani,  
 Shin; Shima, Masaki; Yaki, Hiromasa; Tarui,  
 Hisaki; Kurokawa, Hiroshi; Asaoka, Kenji; Matsuta,  
 Shigeki; Domoto, Yoichi; Ohshita, Ryuji; Kato,  
 Yoshio; Nakajima, Hiroshi

PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan

SOURCE: PCT Int. Appl., 85 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 9  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2001031722	A1	20010503	WO 2000-JP7294	20001020
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
CA 2387364	A1	20010503	CA 2000-2387364	20001020
AU 200079508	A	20010508	AU 2000-79508	20001020
EP 1231653	A1	20020814	EP 2000-969914	20001020
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, MC, IE, SI, LT, LV, FI, RO, MK, CY, AL				
TW 515124	B	20021221	TW 2000-89122034	20001020
CN 1591933	A	20050309	CN 2004-10083106	20001020
JP 3733069	B2	20060111	JP 2001-533573	20001020
US 7235330	B1	20070626	US 2002-111070	20020419
PRIORITY APPLN. INFO.:			JP 1999-301646	A 19991022
			JP 1999-357808	A 19991216
			JP 1999-365306	A 19991222
			JP 1999-374512	A 19991228
			JP 2000-39454	A 20000217
			JP 2000-47675	A 20000224
			JP 2000-90583	A 20000329
			JP 2000-207274	A 20000707
			WO 2000-JP7294	W 20001020

ED Entered STN: 04 May 2001

AB The **anodes** have a thin Li intercalating active mass film on a collector, which has a **surface roughness** Ra  $\geq 0.01 \mu\text{m}$ .

IC H01M004-66; H01M004-02; H01M004-04; H01M004-38; H01M004-48;  
 H01M004-58; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
 ST secondary lithium battery **anode collector**  
**surface roughness**

IT Battery anodes

**Surface roughness**

(**anodes** containing active mass layer on collectors with controlled **surface roughness** for secondary lithium batteries)

IT 7440-21-3, Silicon, uses 7440-56-4, Germanium, uses  
 (**anodes** containing active mass layer on collectors with controlled **surface roughness** for secondary

lithium batteries)  
 IT 7440-50-8, Copper, uses  
 (anodes containing active mass layer on collectors with  
 controlled surface roughness for secondary  
 lithium batteries)

REFERENCE COUNT: 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR  
 THIS RECORD. ALL CITATIONS AVAILABLE IN THE  
 RE FORMAT

L38 ANSWER 20 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2001:301032 HCAPLUS Full-text

DOCUMENT NUMBER: 134:283350

TITLE: Anodes for secondary lithium batteries  
 and the batteries

INVENTOR(S): Ikeda, Hiroaki; Fujimoto, Masahisa; Fujitani,  
 Shin; Shima, Masaki; Yagi, Hiromasa; Tarui,  
 Hisaki; Kurokawa, Hiroshi; Asaoka, Kenji; Matsuda,  
 Shigeki; Domoto, Yoichi; Ohshita, Ryuji; Kato,  
 Yoshio; Nakajima, Hiroshi; Yoshida, Toshikazu

PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan

SOURCE: PCT Int. Appl., 101 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 9

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2001029918	A1	20010426	WO 2000-JP7297	20001020
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
CA 2388013	A1	20010426	CA 2000-2388013	20001020
AU 200079511	A	20010430	AU 2000-79511	20001020
EP 1244164	A1	20020925	EP 2000-969917	20001020
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL				
TW 515124	B	20021221	TW 2000-89122034	20001020
JP 3733066	B2	20060111	JP 2001-531165	20001020
PRIORITY APPLN. INFO.:			JP 1999-301646	A 19991022
			JP 1999-357808	A 19991216
			JP 1999-365306	A 19991222
			JP 1999-374512	A 19991228
			JP 2000-39454	A 20000217
			JP 2000-47675	A 20000224
			JP 2000-90583	A 20000329
			JP 2000-100405	A 20000403

JP 2000-150496 A 20000522  
 JP 2000-207274 A 20000707  
 WO 2000-JP7297 W 20001020

ED Entered STN: 27 Apr 2001  
 AB The **anodes** have a thin Li intercalating active mass film deposited on both sides of a collector plate. The collector plate is preferably a Cu foil having a **surface roughness** Ra 0.1-1  $\mu\text{m}$ , and the active mass is Si and/or Ge.  
 IC H01M004-66; H01M004-02; H01M004-04; H01M004-38; H01M004-48; H01M004-58; H01M010-40  
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
 ST secondary lithium battery **anode** copper **collector** roughness; silicon **anode** copper **collector** roughness lithium battery; germanium **anode** copper **collector** roughness lithium battery  
 IT Battery electrodes  
     **Surface roughness**  
     (copper foil collectors with **roughened surface** for **anodes** in secondary lithium batteries)  
 IT 7440-21-3, Silicon, uses 7440-56-4, Germanium, uses (copper foil collectors with **roughened surface** for **anodes** in secondary lithium batteries)  
 IT 7440-50-8, Copper, uses (copper foil collectors with **roughened surface** for **anodes** in secondary lithium batteries)  
 REFERENCE COUNT: 33 THERE ARE 33 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L38 ANSWER 21 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 2001:655029 HCAPLUS Full-text  
 DOCUMENT NUMBER: 135:213476  
 TITLE: Secondary lithium batteries with excellent charge-discharge cycle characteristics  
 INVENTOR(S): Kusumoto, Yasuyuki; Fujimoto, Masahisa; Fujitani, Noboru  
 PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 4 pp.  
           CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 2001243957	A	20010907	JP 2000-53433	20000229
PRIORITY APPLN. INFO.:			JP 2000-53433	20000229

ED Entered STN: 07 Sep 2001  
 AB In the batteries, Li metal is deposited on **anode collector** surface on charging and the deposited Li is dissolved on discharging. The Li-deposited **anode collector** surface has 10-point average **surface roughness** (Rz; defined in JIS B 0601)  $\leq 10 \mu\text{m}$ . The metals forming the Li-deposited **anode collector** surface may contain Cu, Ni, or Fe. Formation of lithium dendrite is prevented.  
 IC ICM H01M004-64  
 ICS H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
 ST secondary lithium battery **anode surface roughness**; dendrite lithium formation prevention battery **anode**  
 IT **Battery anodes**  
     **Surface roughness**  
     (anode collectors with certain **surface roughness** for use in secondary lithium batteries showing prevented lithium dendrite formation)  
 IT Secondary batteries  
     (lithium; **anode collectors** with certain **surface roughness** for use in secondary lithium batteries showing prevented lithium dendrite formation)  
 IT 7439-89-6, Iron, uses 7440-02-0, Nickel, uses 7440-50-8, Copper, uses 11109-50-5, SUS 304  
     (**anode collector**; **anode collectors** with certain **surface roughness** for use in secondary lithium batteries showing prevented lithium dendrite formation)  
 IT 7439-93-2, Lithium, uses  
     (**anode collectors** with certain **surface roughness** for use in secondary lithium batteries showing prevented lithium dendrite formation)

L38 ANSWER 22 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2001:564110 HCAPLUS Full-text

DOCUMENT NUMBER: 135:139843

TITLE: Secondary **lithium** battery with copper foil **anode collector**

INVENTOR(S): Hara, Kenji; Takazuka, Yuichi; Higashimoto, Koji; Hironaka, Kensuke

PATENT ASSIGNEE(S): Shin-Kobe Electric Machinery Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 8 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 2001210330	A	20010803	JP 2000-15208	20000125
JP 3783503	B2	20060607		
PRIORITY APPLN. INFO.:			JP 2000-15208	20000125

ED Entered STN: 03 Aug 2001

AB The battery is equipped with a cathode plate containing Li mixed oxide and an **anode** plate containing Li-intercalating carbonaceous active mass coated on both sides of an **anode collector**, where the **anode collector** shows area increase ratio 0.5-2% per unit area when pressing the **anode** plate to give predetd. bulk d. of the **anode** mass. Preferably, the **anode collector** is a Cu foil having thickness  $\geq 9 \mu\text{m}$  and **surface roughness** (Ra)  $\geq 0.10$ . The battery is prevented from short circuit and has long service life.

IC ICM H01M004-64

ICS H01M004-02; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **lithium** battery carbonaceous **anode** copper **current collector**

IT **Battery anodes**

(copper foil **current collector** in pressed

carbonaceous **anode** for Li battery)  
 IT Secondary batteries  
     (lithium; copper foil **current collector**  
     in pressed carbonaceous **anode** for Li battery)  
 IT 12057-17-9, Lithium manganese oxide (LiMn<sub>2</sub>O<sub>4</sub>)  
     (cathode; copper foil **current collector** in  
     pressed carbonaceous **anode** for Li battery)  
 IT 7440-44-0, CarbotronP, uses 7440-50-8, Copper, uses  
     (copper foil **current collector** in pressed  
     carbonaceous **anode** for Li battery)

L38 ANSWER 23 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2001:469478 HCAPLUS Full-text

DOCUMENT NUMBER: 135:63786

TITLE: Manufacture of electrode for secondary  
     **lithium** ion battery, the electrode, and  
     battery using it

INVENTOR(S): Takano, Fumio; Nakayama, Akira; Nakamura, Katsuya;  
     Yamakawa, Masahiro

PATENT ASSIGNEE(S): Nippon Zeon Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 10 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 2001176517	A	20010629	JP 1999-361717	19991220
PRIORITY APPLN. INFO.:			JP 1999-361717	19991220

ED Entered STN: 29 Jun 2001

AB The electrode is manufactured by coating a slurry containing a carbonaceous material or a metal oxide, a binder, and a liquid substance on a **current collector**, drying, and then pressing, where the binder contains polymer particles having gel content  $\geq 50\%$  and the electrode before pressing has **surface roughness**  $\leq 6 \mu\text{m}$ . The resulting electrode and a secondary Li ion battery using the electrode are also claimed. The electrode has good adhesion of active mass.

IC ICM H01M004-62

ICS H01M004-04; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST electrode manuf polymer binder **lithium** ion battery

IT Secondary batteries

(**lithium**; manufacture of electrode containing polymer particle by  
 pressing for **lithium** ion battery)

IT **Battery anodes**

Battery cathodes

(manufacture of electrode containing polymer particle by pressing for  
**lithium** ion battery)

IT 7782-42-5, KS 15, uses

(**anode**; manufacture of electrode containing polymer particle by  
 pressing for **lithium** ion battery)

IT 12190-79-3, Cell Seed C 5

(cathode; manufacture of electrode containing polymer particle by pressing  
 for **lithium** ion battery)

IT 9052-84-0P, 1,3-Butadiene-divinylbenzene-styrene copolymer

137162-67-5P, Divinylbenzene-2-ethylhexyl acrylate-methyl  
 methacrylate-styrene copolymer



(latex, binder; manufacture of electrode containing polymer particle by pressing for **lithium** ion battery)

L38 ANSWER 24 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2000:191287 HCAPLUS Full-text

DOCUMENT NUMBER: 132:210255

TITLE: Porous copper foils and their usages and manufacture

INVENTOR(S): Sugimoto, Akiko; Obata, Shinichi; Yoshioka, Atsushi; Dobashi, Makoto; Takahashi, Naotomi; Kataoka, Takashi; Sakai, Hisao; Takahashi, Masaru; Babasaki, Youichi; Matsui, Yoshinari; Hara, Yasuji

PATENT ASSIGNEE(S): Mitsui Mining & Smelting Co., Ltd., Japan; et al.

SOURCE: PCT Int. Appl., 37 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2000015875	A1	20000323	WO 1999-JP4967	19990913
W: BR, CA, CN, ID, JP, KR, PL, US				
RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE				
EP 1038994	A1	20000927	EP 1999-943293	19990913
R: DE, FR, GB, LU				
JP 3262558	B2	20020304	JP 2000-570395	19990913
TW 428049	B	20010401	TW 1999-88115729	19991117
PRIORITY APPLN. INFO.:			JP 1998-279381	A 19980914
			WO 1999-JP4967	W 19990913

ED Entered STN: 24 Mar 2000

AB The foils contain Cu flake particles, having average diameter 1-50 .  $\mu$ m in the plane direction, formed by electrodeposition and connected in their plane surface, and have light transmittance  $\geq 0.01\%$  and **surface roughness** difference 5-20  $\mu$ m between the surface facing the **neg. electrode** and the opposite side during the deposition. The foils are useful for **anode collectors** in secondary batteries. The foils are prepared depositing Cu on Al, Al alloy, Ti, or Ti electrode by electrolysis and separating the foil from the electrode.

IC ICM C25D001-04

ICS H01M004-80

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST battery **anode collector** porous copper foil structure manuf

IT **Battery anodes**

(structure and manufacture of porous copper foils by electrodeposition for **anode collectors** in secondary batteries)

IT 7429-90-5, Aluminum, uses

(pretreatment of aluminum electrodes for electrodeposition of porous copper **anode collectors** for secondary batteries)

IT 7440-50-8P, Copper, uses

(structure and manufacture of porous copper foils by electrodeposition for **anode collectors** in secondary batteries)

IT 7440-32-6, Titanium, uses

(titanium electrodes for electrodeposition of porous copper **anode collectors** for secondary batteries)

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR  
THIS RECORD. ALL CITATIONS AVAILABLE IN THE  
RE FORMAT

L38 ANSWER 25 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2000:741244 HCAPLUS Full-text  
DOCUMENT NUMBER: 133:284191  
TITLE: Copper foil for **anode collector**  
of Li ion battery and its manufacture  
INVENTOR(S): Ozaki, Toshinori; Kodaira, Muneo  
PATENT ASSIGNEE(S): Hitachi Cable, Ltd., Japan  
SOURCE: Jpn. Kokai Tokkyo Koho, 4 pp.  
CODEN: JKXXAF  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 2000294251	A	20001020	JP 1999-98976	19990406
PRIORITY APPLN. INFO.:			JP 1999-98976	19990406

ED Entered STN: 20 Oct 2000  
AB The Cu foil with average **surface roughness** 0.01-5 .  $\mu$ m is coated with 0.01-300- $\mu$ m carbonaceous grain layers with average size 0.001-30  $\mu$ m. The foil in a battery **anode** shows improved adhesion strength to carbon layers.  
IC ICM H01M004-66  
ICS H01M004-02  
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)  
Section cross-reference(s): 56  
ST copper **collector** battery **anode** carbonaceous grain attachment; adhesion strength battery **anode collector** carbon; lithium ion battery **anode collector** copper  
IT **Battery anodes**  
(copper foil having carbonaceous grain layer for Li ion battery **anode collector**)  
IT Carbonaceous materials (technological products)  
(copper foil having carbonaceous grain layer for Li ion battery **anode collector**)  
IT Secondary batteries  
(lithium; copper foil having carbonaceous grain layer for Li ion battery **anode collector**)  
IT 110-54-3, Hexane, processes 7782-42-5, Graphite, processes 9003-28-5, Polybutene 9003-53-6, Polystyrene 52953-73-8, Copper carbonyl  
(carbonization of; copper foil having carbonaceous grain layer for Li ion battery **anode collector**)  
IT 7440-50-8, Copper, uses  
(copper foil having carbonaceous grain layer for Li ion battery **anode collector**)

L38 ANSWER 26 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN  
ACCESSION NUMBER: 2000:32655 HCAPLUS Full-text  
DOCUMENT NUMBER: 132:66676  
TITLE: Secondary nonaqueous electrolyte batteries  
INVENTOR(S): Mori, Nobufumi  
PATENT ASSIGNEE(S): Fuji Photo Film Co., Ltd., Japan  
SOURCE: Jpn. Kokai Tokkyo Koho, 15 pp.

DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2000012088	A	20000114	JP 1998-171664	19980618
PRIORITY APPLN. INFO.:			JP 1998-171664	19980618

ED Entered STN: 14 Jan 2000

AB The batteries use Li containing transition metal oxide cathodes and Li intercalating Si compound **anodes**, where the **anode collectors** are 5-100  $\mu$ m thick metal foils having average **surface roughness** 0.03-1  $\mu$ m. The **anode collectors** are preferably Cu, Ni, Ti, their alloy, or stainless steel foils.

IC ICM H01M010-40

ICS H01M004-02; H01M004-58; H01M004-64

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST battery lithium intercalating silicon compd **anode collector**; roughness metal collector lithium silicon compd **anode**

IT **Battery anodes**

**Surface roughness**

(metal foil **collectors** with controlled roughness for silicon compound **anodes** in secondary lithium batteries)

IT Fluoropolymers, uses

(metal foil collectors with controlled roughness for silicon compound **anodes** in secondary lithium batteries)

IT 7440-21-3, Silicon, uses 7631-86-9, Silica, uses 7782-42-5,

Graphite, uses 24937-79-9, Polyvinylidene fluoride 193072-79-6

(metal foil collectors with controlled roughness for silicon compound **anodes** in secondary lithium batteries)

IT 7440-02-0, Nickel, uses 7440-32-6, Titanium, uses 7440-50-8,

Copper, uses 11109-50-5, Sus 304

(metal foil collectors with controlled roughness for silicon compound **anodes** in secondary lithium batteries)

L38 ANSWER 27 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 1997:768954 HCAPLUS Full-text

DOCUMENT NUMBER: 128:50743

TITLE: Secondary nonaqueous electrolyte batteries using electrodeposited metal foils for electrode collectors

INVENTOR(S): Benno, Hiroshi; koike, Takeshi; Kiyama, Seiichi;

Suzuki, Akitoshi; Otsuka, Hideo; Nakaoka, Tadao

PATENT ASSIGNEE(S): Sony Corp., Japan; Furukawa Circuit Foil Co., Ltd.

SOURCE: Jpn. Kokai Tokkyo Koho, 8 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 09306504	A	19971128	JP 1996-113710	19960508
JP 3742144	B2	20060201		
PRIORITY APPLN. INFO.:			JP 1996-113710	19960508

ED Entered STN: 10 Dec 1997

AB The batteries use electrodeposited metal foils for electrode collectors, where the foils have 10-point average roughness  $R \leq 3.0 \mu\text{m}$  on 1 side and the other side has a 10-point average roughness  $= R \pm 2.5 \mu\text{m}$ . The cathode is preferably a Li containing metal oxide cathode, the **anodes** is a Li intercalating **anode**, and the foil is Cu foil, which may be coated with an anti-rusting film or a silane coupling agent.

IC ICM H01M004-64  
ICS C25D001-04; H01M004-66; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST lithium battery electrode electrodeposited copper collector;  
**surface roughness** electrodeposited copper electrode collector

IT **Battery anodes**  
(electrodeposited copper **collector** foils with controlled **surface roughness** for **anodes** in secondary lithium batteries)

IT Coke  
(pitch; lithium intercalating **anodes** with electrodeposited copper collector foils of controlled **surface roughness** for batteries)

IT 7440-50-8P, Copper, preparation  
(electrodeposited copper collector foils with controlled **surface roughness** for **anodes** in secondary lithium batteries)

L38 ANSWER 28 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 1997:648809 HCAPLUS Full-text

DOCUMENT NUMBER: 127:309505

TITLE: Stacked batteries showing high volume utilization and excellent sealing property

INVENTOR(S): Kagawa, Hiroshi; Murata, Kazuo

PATENT ASSIGNEE(S): Yuasa Battery Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 4 pp.  
CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 09259897	A	19971003	JP 1996-62175	19960319
PRIORITY APPLN. INFO.:			JP 1996-62175	19960319

ED Entered STN: 11 Oct 1997

AB The title batteries comprise (A) nonporous external bodies having maximum **surface roughness**  $R_{\text{max}} 1 \mu\text{m}$  ( $\leq 1/20$  of substrate thickness) and  $\geq 50/\text{mm}$  of unevenness, and alternatively laminated (B) cathode sheets (containing  $\leq 0.025 \text{ mm}$  thickness of current **collectors**) and (C) **anode** sheets (containing  $\leq 0.015 \text{ mm}$  thickness of current collectors); whereas edges of each cathodes or each **anodes** are elec. parallel connected and most external current collectors are elec. connected with the external bodies, and each external bodies are air-tightly sealed by adhesives. The batteries show high mech. strength due to high volume occupancy.

IC ICM H01M006-18  
ICS H01M002-02; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

L38 ANSWER 29 OF 63 HCAPLUS COPYRIGHT 2007 ACS on STN  
 ACCESSION NUMBER: 1997:116273 HCAPLUS Full-text  
 DOCUMENT NUMBER: 126:120034  
 TITLE: Secondary **lithium** batteries and their  
 electrodes having improved aluminum  
**current collectors**  
 INVENTOR(S): Katagiri, Nobuo; Hayashi, Yoshitaka; Kurosawa,  
 Yoshiko; Fujii, Toshishige; Kahata, Toshuki;  
 Kimura, Okitoshi; Iechi, Hiroyuki; Oosawa, Toshuki  
 PATENT ASSIGNEE(S): Ricoh Kk, Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 7 pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 08298137	A	19961112	JP 1995-126026	19950426
PRIORITY APPLN. INFO.:			JP 1995-126026	19950426

ED Entered STN: 20 Feb 1997

AB The electrodes contain active mass layers and Al foils as **current collectors** having capacitance with **surface roughness**  $\geq 50 \mu\text{F}/\text{cm}^2$ . Preferably, the active mass layers are prepared by uniform dispersion of granular inorg. active mass in electrochem. oxidation-reduction electroconductive polymer matrixes. The batteries have electrolytes containing  $\text{LiN}(\text{CF}_3\text{SO}_2)_2$  and optionally  $\text{LiBF}_4$ ,  $\text{LiAsF}_6$ , and/or  $\text{LiPF}_6$ . Preferably, the electrolytes are polymer solid electrolytes containing carbonates in crosslinked polymers as matrixes. The batteries have high performance.

IT 7439-93-2, **Lithium**, uses  
 (battery **anodes**)

RN 7439-93-2 HCAPLUS

CN **Lithium** (CA INDEX NAME)

Li

IC ICM H01M010-40

ICS H01M010-40; H01M004-02; H01M004-64

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **lithium** battery aluminum **current collector**

; carbonate solid electrolyte **lithium** battery; polymer  
 electroconductive active mass cathode

IT Battery cathodes

(aluminum **current collectors** for)

IT Secondary batteries

(**lithium**; high-performance)

IT 7439-93-2, **Lithium**, uses

(battery **anodes**)

IT 1313-13-9, Manganese dioxide, uses 1314-62-1, Vanadium oxide ( $\text{V}_2\text{O}_5$ ),  
 uses 12190-79-3, Cobalt **lithium** oxide ( $\text{LiCoO}_2$ )

25233-30-1, Polyaniline

(battery cathodes containing)

IT 7429-90-5, Aluminum, uses

(battery cathodes with **current collectors** of)

10/691,476

IT 96-49-1, Ethylene carbonate 616-38-6, Dimethyl carbonate  
14283-07-9, Lithium tetrafluoroborate (LiBF<sub>4</sub>) 21324-40-3,  
Lithium hexafluorophosphate 29935-35-1, Lithium  
hexafluoroarsenate (LiAsF<sub>6</sub>) 90076-65-6  
(battery electrolytes containing)

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L38 ANSWER 30 OF 63 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN  
ACCESSION NUMBER: 2007-342437 [32] WPIX  
DOC. NO. CPI: C2007-124577 [32]  
DOC. NO. NON-CPI: N2007-253341 [32]  
TITLE: **Negative electrode for  
lithium rechargeable battery for use in  
portable electronic devices, comprises thermosetting  
resin layer e.g. polyimide between current  
collector and negative active material layer**  
DERWENT CLASS: A85; L03; X16  
INVENTOR: JEONG G; KIM S; NITTA Y; SUNG M  
PATENT ASSIGNEE: (JEON-I) JEONG G; (KIMS-I) KIM S; (NITT-I) NITTA Y;  
(SUNG-I) SUNG M  
COUNTRY COUNT: 1

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 20070059604	A1	20070315	(200732)*	EN	12	[4]

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20070059604	A1	US 2006-506466	20060818

PRIORITY APPLN. INFO: KR 2005-76209 20050819

INT. PATENT CLASSIF.:

IPC ORIGINAL: H01M0004-62 [I,A]; H01M0004-62 [I,C]; H01M0004-66  
[I,A]; H01M0004-66 [I,C]

BASIC ABSTRACT:

US 20070059604 A1 UPAB: 20070521

NOVELTY - A **negative electrode** (14) for a **lithium** rechargeable battery (10), comprises a **current collector**; a thermosetting resin layer e.g. polyimide on the **current collector**; and a negative active material layer on the thermosetting resin layer.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(a) preparing a cathode for **lithium** rechargeable battery, comprising coating a composition for forming a thermosetting resin layer on a **current collector** to form a thermosetting resin layer; and coating a negative active material slurry on the thermosetting resin layer; and

(b) **lithium** rechargeable battery comprising a cathode, **anode** (13) comprising a positive active material, and electrolyte.

USE - Cathode is used for **lithium** rechargeable battery used as power sources for small, portable electronic devices.

ADVANTAGE - The thermosetting resin increases **surface roughness** at the interface between the **current collector** and thermosetting resin layer and increases the strength of adhesion of the negative active material layer to the **current collector** and a negative active material layer. This improves the cycle-life characteristics and safety of the battery.

DESCRIPTION OF DRAWINGS - The figure shows a cross-sectional view of a lithium rechargeable battery.

- Lithium rechargeable battery (10)
- Electrode assembly (12)
- Positive electrode (13)
- Negative electrode (14)
- Separator (15)
- Sealing gasket (18)

#### TECHNOLOGY FOCUS:

**METALLURGY** - Preferred Components: The **current collector** is copper foil, nickel foil, stainless steel foil, titanium foils, nickel foam, and/or copper foam. Metal ions from the **current collector** diffuse into the thermosetting resin layer. An amount of metal ions at an interface between the **current collector** and the thermosetting resin layer is 0.001-0.1 weight % based on the total weight of the thermosetting resin layer. The metal ions diffused into the thermosetting resin layer are present in a concentration gradient across the thermosetting resin layer in which the metal ions decrease in amount from the interface between the **current collector** and the thermosetting resin layer to the interface of the thermosetting resin layer and the active material layer, where the rate of decrease in the metal ions is 0.0001-0.002 weight %. A weight ratio of metal ions at an interface between the **current collector** and the thermosetting resin layer and metal ions at an interface between the thermosetting resin layer and the active material layer is 100:1-1.5:1. A **surface roughness** (Ra) at an interface between the **current collector** and the thermosetting resin layer is 0.01-5 **microns**. The negative active material layer comprises a negative active material selected from **lithium**, metallic materials capable of alloying with **lithium**, or composite materials of carbonaceous materials and metallic materials capable of alloying with **lithium**.

**POLYMERS** - Preferred Materials: The **current collector** is a polymer substrate coated with conductive metal. The thermosetting resin layer comprises polyimide, polyurethane, epoxy resins, and/or nylon, and has a thickness of 0.01-1 **microns**. The thermosetting resin layer comprises a metal compound reactant of the metal ions in the **current collector** and the thermosetting resin. The negative active material layer further comprises a binder selected from polyvinyl chloride, polyvinyl difluoride, polymer, polymethylmethacrylate, polyvinylalcohol, carboxylated polyvinylchloride, polyvinylidene fluoride, polyimide, polyurethane, epoxy resin, nylon, styrene-butadiene rubbers, and/or acrylated styrene-butadiene rubbers. The negative active material layer has a thickness of 20-200 **microns**. Preferred Compositions: The composition for forming a thermosetting resin layer comprises 1-50 weight % thermosetting resin.

#### EXTENSION ABSTRACT:

**EXAMPLE** - Polyvinylidene fluoride as a binder and silicon as a negative active material were added to an N-methylpyrrolidone solvent to prepare a negative active material slurry. The weight ratio of the negative active material to the binder was 95:5. A thermosetting resin composition was prepared by dissolving polyamic acid (0.5 g) in N-methylpyrrolidone (2 g). The thermosetting resin composition was then coated on a copper foil **current collector** by screen printing and dried to form a 1 **microns**-thick thermosetting resin layer. Then, the negative active material slurry

was coated on the thermosetting resin layer, dried at 90degreesC, and then compressed to prepare a **negative electrode**.

This showed an adhesion strength of 850%.

FILE SEGMENT: CPI; EPI  
MANUAL CODE: CPI: A11-B05; A12-E06A; L03-E01B9A  
EPI: X16-B01F1; X16-E01A1; X16-E02

L38 ANSWER 31 OF 63 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN  
ACCESSION NUMBER: 2006-123902 [13] WPIX  
DOC. NO. CPI: C2006-043428 [13]  
DOC. NO. NON-CPI: N2006-107071 [13]  
TITLE: Non-aqueous electrolyte secondary battery comprises positive electrode mixture, which includes positive electrode active material that includes **lithium**-containing compound having olivine structure, conducting agent, and binder  
DERWENT CLASS: A14; A85; L03; X16  
INVENTOR: DONOUE K; FUJIMOTO M; INOUE T; YU D Y W  
PATENT ASSIGNEE: (SAOL-C) SANYO ELECTRIC CO LTD  
COUNTRY COUNT: 2

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 20060014076	A1	20060119	(200613)*	EN	8	[1]
JP 2006032144	A	20060202	(200613)	JA	12	

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20060014076	A1	US 2005-181894	20050715
JP 2006032144	A	JP 2004-209828	20040716

PRIORITY APPLN. INFO: JP 2004-209828 20040716

## INT. PATENT CLASSIF.:

IPC ORIGINAL: H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-58 [I,A]; H01M0004-58 [I,C]; H01M0004-62 [I,A]; H01M0004-62 [I,A]; H01M0004-62 [I,C]

## BASIC ABSTRACT:

US 20060014076 A1 UPAB: 20060224

NOVELTY - A non-aqueous electrolyte secondary battery comprises a positive electrode (1) mixture, a **negative electrode** (2), and a non-aqueous electrolyte (5), where positive electrode mixture includes a positive electrode active material that includes a **lithium**-containing compound having an olivine structure, a conducting agent, and a binder, which includes a copolymer of polyvinylidene fluoride, tetrafluoroethylene, and hexafluoropropylene.

USE - Used as non-aqueous electrolyte secondary battery.

ADVANTAGE - The non-aqueous electrolyte secondary battery is of low-cost, and has increased capacity and increased energy density and good discharge characteristics during discharge at high rate.

DESCRIPTION OF DRAWINGS - The figure is a schematic diagram of a test cell.

Positive electrode (1)  
**Negative electrode** (2)  
Reference electrode (3)  
Separator (4)



Non-aqueous electrolyte (5) TECHNOLOGY FOCUS:

INORGANIC CHEMISTRY - Preferred Component: The **lithium**-containing compound having the olivine structure is of formula  $\text{Li}_x\text{M}_1-(d+t+q+r)\text{DdTtQqR-r}(\text{XO}_4)$ .

$x$ =greater than 0, less than or equal to 1;

$d, t, q, r=0-1$ ;

$M$ =iron, manganese, cobalt, titanium, and/or nickel;

$X$ =silicon, sulfur, phosphorus, and/or vanadium;

$D$ =bivalent ion consisting of  $\text{Mg}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Zn}^{2+}$ , or  $\text{Cu}^{2+}$ ;

$T$ =trivalent ion consisting of  $\text{Al}^{3+}$ ,  $\text{Ti}^{3+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Mn}^{3+}$ ,  $\text{Ga}^{3+}$ ,  $\text{Zn}^{3+}$ , or  $\text{V}^{3+}$ ;

$Q$ =quadrivalent ion consisting of  $\text{Ti}^{4+}$ ,  $\text{Ge}^{4+}$ ,  $\text{Sn}^{4+}$ , or  $\text{V}^{4+}$ ; and

$R$ =pentavalent ion consisting of  $\text{V}^{5+}$ ,  $\text{Nb}^{5+}$ , or  $\text{Ta}^{5+}$ .

The **lithium**-containing compound having the olivine structure is **lithium** iron phosphate. Preferred Parameter: The **lithium**-containing compound having the olivine structure has a particle size of not greater than 10, preferably not greater than 5 **microns**.

POLYMERS - Preferred Parameter: The proportion of the copolymer to the positive electrode mixture is not less than 1 weight% and not greater than 15 weight%. The proportion of the conducting agent to the positive electrode mixture is not greater than 10 weight%.

#### EXTENSION ABSTRACT:

EXAMPLE - **Lithium** iron phosphate and Denka Black (RTM; acetylene black) were mixed first. A copolymer of polyvinylidene fluoride, tetrafluoroethylene, and hexafluoropropylene was added as a binder to the mixture, followed by the addition of an amount of N-methyl-2-pyrrolidone to the mixture to prepare a slurry. The weight ratio of **lithium** iron phosphate, conducting agent, and binder was 90:5:5. The slurry was applied as a positive electrode mixture onto a piece of aluminum foil having a **roughed surface**, as a **current collector**, and dried at 80degreesC. A 2x2 cm square was subsequently cut from the **current collector** coated with the positive electrode mixture, and the piece was rolled and dried at 100degreesC, under vacuum. The positive electrode was thus fabricated.

FILE SEGMENT: CPI; EPI

MANUAL CODE: CPI: A12-E06; L03-E01B5B; L03-E03

EPI: X16-E01C; X16-E01E; X16-E01J; X16-E08A; X16-E09

L38 ANSWER 32 OF 63 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN

ACCESSION NUMBER: 2006-144259 [15] WPIX

DOC. NO. CPI: C2006-048827 [15]

DOC. NO. NON-CPI: N2006-124738 [15]

TITLE: Improvement of life of thin film rechargeable battery for e.g. microelectronic devices and remote sensors, by applying planarization material over **anode** layer and thin film battery, and applying barrier layer(s) to planarization layer

DERWENT CLASS: A85; L03; X16

INVENTOR: BATES J B

PATENT ASSIGNEE: (OAKR-N) OAK RIDGE MICRO-ENERGY INC

COUNTRY COUNT: 1

#### PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 6994933	B1	20060207	(200615)*	EN	10[7]	

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 6994933 B1		US 2002-244260	20020916

PRIORITY APPLN. INFO: US 2002-244260 20020916

INT. PATENT CLASSIF.:

IPC ORIGINAL: H01M0002-00 [I,A]; H01M0002-00 [I,C]; H01M0006-04 [I,C]; H01M0006-12 [I,A]; H01M0006-42 [I,C]; H01M0006-46 [I,A]

BASIC ABSTRACT:

US 6994933 B1 UPAB: 20060302

NOVELTY - Improvement of life of a thin film rechargeable battery (32), comprises applying a planarization material over an **anode** (24) layer and thin film battery to provide a relatively smooth, pinhole free planarization layer; and applying barrier layer(s) to the planarization layer, the barrier layers consisting of metal materials, ceramic materials, or polymeric materials.

DETAILED DESCRIPTION - Improvement of life of a thin film rechargeable battery having a solid electrolyte (22), comprises providing a thin film **battery** having an **anode** layer reactive with oxygen and water vapor; applying a planarization material over the **anode** layer and thin film battery to provide a relatively smooth, pinhole free planarization layer, where **surface roughness** of the planarization layer is not greater than 1.0 nm root mean square, and the planarization material in the planarization layer is non-reactive with the **anode** layer; and applying barrier layer(s) to the planarization layer, the barrier layers consisting of metal materials, ceramic materials, or polymeric materials, where planarization layer and barrier layer(s) provide a thin film battery having an extended life.

An INDEPENDENT CLAIM is also included for a long-life, thin film rechargeable battery, comprising a support substrate having a support surface; a cathode **current collector** (16) spaced-apart from an **anode current collector** (18) deposited on the support surface of the substrate; a cathode (20) layer deposited on a portion of the cathode **current collector**; a solid electrolyte layer deposited on the cathode material, substrate, and a first portion of the **anode current collector**; an **anode** layer deposited on the electrolyte layer, and a second portion of the **anode current collector** to provide a thin film battery stack; a planarization material applied over the thin film battery stack, to provide a relatively smooth planarization layer having a **surface roughness** of not greater than 1.0 nm root mean square, and the planarization material in the planarization layer is nonreactive with the **anode** layer; and barrier layer(s) applied over the planarization layer, and consisting of metal materials, ceramic materials, or polymeric materials, where planarization layer and barrier layer(s) provide a thin film battery having an extended life.

USE - The method is for improvement of life of a thin film rechargeable battery (claimed) for microelectronic devices and circuits, implantable medical devices, remote sensors, miniature transmitters, smart cards, and micro electro mechanical systems devices. The thin film rechargeable battery is used for e.g. PCMCIA (sic) cards and other types of complementary MOS-static RAM devices.

ADVANTAGE - The method provides a thin film battery having an extended life or a life approaching 20 years.

DESCRIPTION OF DRAWINGS - The figure is a cross-sectional view, not to scale, of a thin-film battery containing a planarization/barrier layer.

Cathode **current collector** (16)**Anode current collector** (18)

Cathode (20)

Solid electrolyte (22)

**Anode (24)**

Thin film battery (32)

## TECHNOLOGY FOCUS:

**METALLURGY - Preferred Method:** The method comprises applying a metal layer to the **anode** layer before applying the planarization material to the **anode** layer and thin film battery, where metal layer is provided by a metal that does not alloy with the **anode** layer; depositing a layer of **lithium** phosphorus oxynitride on the metal layer before applying the planarization material to the **anode** layer and thin film battery; depositing magnesium over the planarization layer to provide a getter layer reactive with oxygen and water (H<sub>2</sub>O).

**POLYMERS - Preferred Material:** The planarization material is acrylates, diacrylates, triacrylates, or polyolefins that do not contain an organic acid group. **Preferred Parameter:** The planarization layer has a flatness not greater than 0.005 cm/in.

FILE SEGMENT: CPI; EPI  
 MANUAL CODE: CPI: A12-E06; L03-E01D  
 EPI: X16-B01F; X16-F09

L38 ANSWER 33 OF 63 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN  
 ACCESSION NUMBER: 2005-630767 [64] WPIX  
 DOC. NO. CPI: C2005-189288 [64]  
 DOC. NO. NON-CPI: N2005-517959 [64]  
 TITLE: Nonaqueous-electrolyte battery for mobile telephone, comprises **anode** having **anode** active material-containing layer with olivine-type **lithium** phosphate and having preset thickness and average **surface roughness**, formed on **anode collector**  
 DERWENT CLASS: L03; X16  
 INVENTOR: DONOUE K; FUJIMOTO M; FUJITANI S; INOUE T; YU D Y W  
 PATENT ASSIGNEE: (SAOL-C) SANYO ELECTRIC CO LTD  
 COUNTRY COUNT: 108

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 2005086260	A1	20050915	(200564)*	JA	39[3]	
EP 1722427	A1	20061115	(200675)	EN		
KR 2006095957	A	20060905	(200705)	KO		
CN 1842931	A	20061004	(200715)	ZH		

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2005086260	A1	WO 2005-JP2154	20050214
EP 1722427	A1	EP 2005-710162	20050214
EP 1722427	A1	WO 2005-JP2154	20050214
KR 2006095957	A	WO 2005-JP2154	20050214
KR 2006095957	A	KR 2006-705116	20060313
CN 1842931	A	CN 2005-80001021	20050214

## FILING DETAILS:

PATENT NO	KIND	PATENT NO
EP 1722427	A1 Based on	WO 2005086260 A

KR 2006095957 A Based on WO 2005086260 A

PRIORITY APPLN. INFO: JP 2004-80749 20040319  
JP 2004-58375 20040303

## INT. PATENT CLASSIF.:

IPC ORIGINAL: H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-58 [I,A]; H01M0004-58 [I,A]; H01M0004-58 [I,C]; H01M0004-66 [I,A]; H01M0004-66 [I,C]

IPC RECLASSIF.: H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-58 [I,A]; H01M0004-58 [I,C]; H01M0004-66 [I,A]; H01M0004-66 [I,C]

## BASIC ABSTRACT:

WO 2005086260 A1 UPAB: 20051223

NOVELTY - The nonaqueous-electrolyte **battery** comprises an **anode** (1), a cathode (2) and nonaqueous electrolyte (4). The **anode** has an **anode** active material-containing layer (A) containing olivine-type **lithium** phosphate as an **anode** active material, formed on an **anode collector**. The surface of the layer (A) which contacts the **anode collector**, has average **surface roughness** (Ra) of more than 0.026 **microns**, and thickness of less than 20 **microns**.

USE - E.g., **lithium** ion secondary cells used as vehicle-mounted power supply and drive power supply for information terminals such as mobile telephones, notebook personal computers, personal digital assistants (PDA), electric vehicles and hybrid vehicles.

ADVANTAGE - The nonaqueous-electrolyte battery has excellent capacitance, charging and discharging characteristics, electroconductivity, and adhesivity of **anode** active material and **anode collector**, without reduction of energy density of **anode**.

DESCRIPTION OF DRAWINGS - The figure shows the nonaqueous-electrolyte **battery** using the **anode**.

- anode** (1)
- cathode (2)
- nonaqueous electrolyte (4)
- polyethylene separator (5)
- battery container (6)

## TECHNOLOGY FOCUS:

INORGANIC CHEMISTRY - Preferred Components: The olivine-type **lithium** phosphate is **lithium** iron phosphate. The **anode collector** is roughened aluminum foil. A portion of **lithium** in **anode** active material is substituted by transition method. The cathode contains cathode active material which occludes and discharges **lithium**. Preferred Layer: Layer (A) contains electroconductive agent.

ORGANIC CHEMISTRY - Preferred Components: The olivine-type **lithium** phosphate is **lithium** iron phosphate. The **anode collector** is roughened aluminum foil. A portion of **lithium** in **anode** active material is substituted by transition method. The cathode contains cathode active material which occludes and discharges **lithium**. Preferred Layer: Layer (A) contains electroconductive agent.

FILE SEGMENT: CPI; EPI  
MANUAL CODE: CPI: L03-E01B8; L03-H05  
EPI: X16-B01F; X16-E01C

L38 ANSWER 34 OF 63 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN  
ACCESSION NUMBER: 2005-384700 [39] WPIX  
DOC. NO. CPI: C2005-119043 [39]  
DOC. NO. NON-CPI: N2005-311933 [39]  
TITLE: **Lithium** cell comprises first

**current-collecting** plate made of metal, and serving as **anode**, where main surface of first **current-collecting** plate in direct contact with **lithium** foil/**lithium** alloy foil is roughened, by laser machining

DERWENT CLASS: L03; X16  
 INVENTOR: GOTO T; HARADA S; MATSUMOTO H; SUZUKA J  
 PATENT ASSIGNEE: (NITS-C) NGK SPARK PLUG CO LTD  
 COUNTRY COUNT: 37

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 20050112469	A1	20050526	(200539)*	EN	11	[10]
EP 1542297	A2	20050615	(200539)	EN		
JP 2005158397	A	20050616	(200539)	JA	11	

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20050112469	A1	US 2004-988452	20041112
JP 2005158397	A	JP 2003-393712	20031125
EP 1542297	A2	EP 2004-257008	20041111

PRIORITY APPLN. INFO: JP 2003-393712 20031125

INT. PATENT CLASSIF.:

IPC RECLASSIF.: H01M0010-24 [I,C]; H01M0010-28 [I,A]; H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-06 [I,A]; H01M0004-06 [I,C]; H01M0004-40 [I,A]; H01M0004-40 [I,C]; H01M0004-66 [I,A]; H01M0004-66 [I,C]; H01M0006-16 [I,A]; H01M0006-16 [I,C]

## BASIC ABSTRACT:

US 20050112469 A1. UPAB: 20051222

NOVELTY - **Lithium** cell comprises a first **current-collecting** plate (7) made of metal, and serving as an **anode**, where a main surface (7p) of the first **current-collecting** plate in direct contact with a **lithium** foil or a **lithium** alloy foil is roughened, by laser machining.

DETAILED DESCRIPTION - **Lithium** cell comprises:

- (a) a first **current-collecting** plate made of metal, and serving as an **anode**;
- (b) a second **current-collecting** plate serving as a cathode, and facing the first **current-collecting** plate; and
- (c) **lithium** foil or **lithium** alloy foil serving as an **anode** active material, and disposed in direct contact with a main surface of the first **current-collecting** plate, where the main surface of the first **current-collecting** plate in direct contact with the **lithium** foil or the **lithium** alloy foil is roughened, by laser machining.

An INDEPENDENT CLAIM is also included for a method of manufacturing a **lithium** cell using **lithium** foil or **lithium** alloy foil, as an **anode** active substance, comprising **roughening** a main **surface** of a metallic **current-collecting** plate for an **anode**, by irradiating the main surface with a laser beam; and forcing the **lithium** foil or **lithium** alloy foil to closely adhere to the **roughened** main **surface**.

USE - Used as **lithium** cell.

ADVANTAGE - The **lithium** cell has good adherent contact between **lithium** foil and metallic **current-collecting** plate, and exhibits stable adherence

over a long period. In the process of **surface roughening** by blasting, no contaminants remain.

DESCRIPTION OF DRAWINGS - The figure shows a perspective view of a **current-collecting** plate, whose **surface** is **roughened**.

**Current-collecting** plate (7)

Main surface (7p)

Lead terminal (7t)

Craterlike spots (LS)

#### TECHNOLOGY FOCUS:

INORGANIC CHEMISTRY - Preferred Component: Yttrium vanadium oxide laser oscillator capable of performing single-mode oscillation, is used as a source of the laser beam.

METALLURGY - Preferred Component: Craterlike spots (LS), each comprising a rim and a depression are formed of the first metallic **current-collecting** plate in a region in contact with the **lithium** foil or **lithium** alloy foil. They are formed by laser machining. They are arranged regularly. Preferred Material: The first metallic **current-collecting** plate is made of stainless steel. Preferred Dimension: Each of the craterlike spots has a diameter of 20-100 **microns**. The **lithium** foil or **lithium** alloy foil has a thickness of 50-150 **microns**. Preferred Parameter: The craterlike spots are formed, such that a differential height between the rim and depression is 0.5-5 **microns**.

ORGANIC CHEMISTRY - Preferred Component: Yttrium vanadium oxide laser oscillator capable of performing single-mode oscillation, is used as a source of the laser beam.

FILE SEGMENT: CPI; EPI  
MANUAL CODE: CPI: L03-E01B5B  
EPI: X16-E01C; X16-E02

L38 ANSWER 35 OF 63 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN  
ACCESSION NUMBER: 2004-642561 [62] WPIX  
CROSS REFERENCE: 2004-626283  
DOC. NO. CPI: C2004-231109 [62]  
DOC. NO. NON-CPI: N2004-508066 [62]  
TITLE: Cathode for **lithium** secondary battery,  
contains active material layer containing powder-form  
active material which consists of amorphous coated  
graphite, and has preset particle diameter at the  
time of forming grain  
DERWENT CLASS: A85; E36; L03; X16; X21; X25  
INVENTOR: HAYASHI M; ISHIHARA T; KAMADA T  
PATENT ASSIGNEE: (MITU-C) MITSUBISHI CHEM CORP; (TOYT-C) TOYOTA  
JIDOSHA KK  
COUNTRY COUNT: 106

#### PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 2004075318	A1	20040902	(200462)*	JA	48[7]	
EP 1605536	A1	20051214	(200582)	EN		
US 20060147799	A1	20060706	(200645)	EN		
CN 1774826	A	20060517	(200663)	ZH		
KR 2005100697	A	20051019	(200667)	KO		

#### APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
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WO 2004075318 A1	WO 2004-JP1792 20040218
CN 1774826 A	CN 2004-80010152 20040218
EP 1605536 A1	EP 2004-712182 20040218
EP 1605536 A1	WO 2004-JP1792 20040218
US 20060147799 A1 Cont of	WO 2004-JP1792 20040218
US 20060147799 A1	US 2005-208006 20050822
KR 2005100697 A	WO 2004-JP1792 20040218
KR 2005100697 A	KR 2005-715471 20050820

## FILING DETAILS:

PATENT NO	KIND	PATENT NO
EP 1605536	A1 Based on	WO 2004075318 A
KR 2005100697	A Based on	WO 2004075318 A

PRIORITY APPLN. INFO: JP 2003-377994 20031107  
JP 2003-42985 20030220

## INT. PATENT CLASSIF.:

MAIN: H01M004-58  
IPC ORIGINAL: H01M0004-58 [I,A]; H01M0004-58 [I,C]; H01M0004-58 [I,C]; H01M0004-62 [I,A]; H01M0004-62 [I,C]  
IPC RECLASSIF.: H01M0010-36 [I,C]; H01M0010-36 [N,C]; H01M0010-40 [I,A]; H01M0010-40 [N,A]; H01M0004-02 [I,A]; H01M0004-02 [N,A]; H01M0004-02 [I,C]; H01M0004-02 [N,C]; H01M0004-36 [N,A]; H01M0004-36 [N,C]; H01M0004-58 [I,A]; H01M0004-58 [I,C]; H01M0004-62 [I,A]; H01M0004-62 [I,C]

## BASIC ABSTRACT:

WO 2004075318 A1 UPAB: 20060203

NOVELTY - A **lithium** secondary battery cathode comprises active material layer containing active material and organic material. The active material is powder-form active material which consists of amorphous coated graphite. A dispersion liquid is formed by dispersing 100 g of active material powder with 2 g of carboxy methylcellulose in 200 g of water. The particle diameter at the time of forming grain is 50  $\mu$ m or less.

DETAILED DESCRIPTION - A **lithium** secondary battery cathode comprises **current collector** and active material layer containing active material and an organic material capable of exerting binding and thickening effects. The active material is powder-form active material which consists of amorphous coated graphite formed by covering at least one portion of the surface of the graphite particle with an amorphous carbon. A dispersion liquid is formed by dispersing 100 g of active material powder with 2 g of carboxy methylcellulose in 200 g of water. The particle diameter at the time of forming grain is 50  $\mu$ m or less, measured on the basis of dispersion degree according to grind (fineness) gauge method defined in JIS K5400. An INDEPENDENT CLAIM is also included for **lithium** secondary battery which has an **anode** which occlude-discharge **lithium**, a cathode which occlude-discharge **lithium**, and electrolyte.

USE - For **lithium** secondary battery (claimed), such as automatic military **lithium** secondary battery for drive such as notebook computer, mobile telephone, portable information terminal, portable electronic device and domestic small electric power storage apparatus, two-wheeled motor vehicle, electric vehicle, hybrid electric vehicle.

ADVANTAGE - The battery formed using the cathode has high output/input performance by reducing the thickness of the active material layer. The battery is safe and has high durability.

DESCRIPTION OF DRAWINGS - The figure shows the explanatory drawing of fineness gauge method for dispersion degree test. (Drawing includes non-English language text). TECHNOLOGY FOCUS:

INORGANIC CHEMISTRY - Prepared Properties: The number of grains having 35-50 mum particle diameter is 10 pieces or less.

## EXTENSION ABSTRACT:

EXAMPLE - Petroleum type heavy gravity oil obtained at time of naphtha thermal decomposition was mixed with a graphite powder, and carbonization process was performed at 900degreesC in an inert gas. Then grinding-classification processing of the sintered article after appropriate time was performed such that repeated classification with sieve of 400 meshes was performed for 5 times, to prevent mixing of a coarse particle, and amorphous coated black lead was obtained. The obtained cathode active powder was covered with 2 wt.pts of amorphous carbon with respect to 100 wt.pts of black lead. The cathode active material had (d002) value of 0.336 nm, LC of 100 nm or more, peak intensity ratio (R) of -0.33, half value width (DELTAgamma) of 29 cm-1, average particle diameter (D50) of 11 mum, maximum particle diameter (Dmax) of 32 mum, Brunauer Emmett Teller (BET) specific surface area of 5.5 m2/g, diameter of maximum dispersed particle of 25 mum, measured on the basis of dispersion degree according to grind (fineness) gauge method defined in JIS K5400, number of 35-50 mum particle of 0 piece, and average particle diameter of 20 mum. The cathode active material (94 weight%) and carboxy methylcellulose and styrene polybutadiene rubber (3) were stirred-mixed with distilled water as dispersion medium and set as cathode active material slurry. The obtained slurry was mixed uniformly, filtered and removal of aggregate of active material was performed. The obtained slurry was applied on a copper laminate to thickness of 40 mum, dried and cut to length of 850 mm and width of 56 mm, and set as cathode. The battery formed using the obtained cathode, anode, separator and electrolyte, had cathode plate surface roughness of 2 mum, initial stage output of 150%, high temperature capacitance maintenance percentage of 88% and pulse cycle recovery factor of 88%.

FILE SEGMENT: CPI; EPI  
MANUAL CODE: CPI: A03-A04A; A12-E06A; E31-N02; E31-N04B;  
L03-E01B5B  
EPI: X16-B01F1; X16-E01C; X16-E08A

L38 ANSWER 36 OF 63 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN  
ACCESSION NUMBER: 2004-373906 [35] WPIX  
DOC. NO. CPI: C2004-140653 [35]  
DOC. NO. NON-CPI: N2004-297422 [35]  
TITLE: Lithium secondary battery comprises active material layer on current collector and including active material that electrochemically occludes and releases lithium and solid electrolyte filling cracks of active material layer  
DERWENT CLASS: A85; L03; X16  
INVENTOR: FUKUI A; KUSUMOTO Y; MINAMI H; SAYAMA K; TARUI H; TORIMAE M; YAGI H  
PATENT ASSIGNEE: (FUKU-I) FUKUI A; (KUSU-I) KUSUMOTO Y; (MINA-I) MINAMI H; (SAOL-C) SANYO ELECTRIC CO LTD; (SAYA-I) SAYAMA K; (TARU-I) TARUI H; (TORI-I) TORIMAE M; (YAGI-I) YAGI H  
COUNTRY COUNT: 2

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 20040072067	A1	20040415	(200435)*	EN	16	[8]



JP 2004179136 A 20040624 (200441) JA 18  
 US 7153611 B2 20061226 (200702) EN

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20040072067	A1	US 2003-673610	20030930
JP 2004179136	A	JP 2003-27805	20030205

PRIORITY APPLN. INFO: JP 2003-27805 20030205  
 JP 2002-285741 20020930

## INT. PATENT CLASSIF.:

IPC ORIGINAL: H01M0004-64 [I,A]; H01M0006-18 [I,A]  
 IPC RECLASSIF.: H01M0010-04 [I,A]; H01M0010-04 [I,C]; H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0002-16 [N,A]; H01M0002-16 [N,C]; H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-04 [I,A]; H01M0004-04 [I,C]; H01M0004-38 [I,A]; H01M0004-38 [I,C]; H01M0004-40 [I,A]; H01M0004-40 [I,C]; H01M0004-62 [I,A]; H01M0004-62 [I,C]; H01M0004-66 [I,A]; H01M0004-66 [I,C]

## BASIC ABSTRACT:

US 20040072067 A1 UPAB: 20050529

NOVELTY - A **lithium** secondary battery comprises an electrode and a non aqueous electrolyte. The electrode comprises an active material layer (2) provided on a **current collector** (1) and containing an active material (2a) capable of electrochemically occluding and releasing **lithium** and having cracks (4) formed in the layer by occlusion and releasing of **lithium**. The cracks of the active material layer is filled with the solid non aqueous electrolyte (3).

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for a method for manufacturing a **lithium** secondary battery by preparing a temporary battery comprising the electrode and the electrolyte comprising a **lithium** salt; forming cracks in the active material layer by charging and discharging the temporary battery; adding a polymerizable monomer to the electrolyte in the temporary battery; and polymerizing the monomer to form the solid electrolyte and to fill the cracks with the solid electrolyte.

USE - As **lithium** secondary battery.

ADVANTAGE - The invention improves **current collection** of an electrode and provides a **lithium** secondary battery having excellent charge and discharge cycle characteristics.

DESCRIPTION OF DRAWINGS - The figure shows a cross-section of a **negative electrode**.

**Current collector** (1)  
 Active material layer (2)  
 Active material (2a)  
 Binder (2b)  
 Solid electrolyte (3)  
 Cracks (4)

## TECHNOLOGY FOCUS:

ELECTRICAL POWER AND ENERGY - Preferred Components: The entire non aqueous electrolyte is the solid electrolyte. Alternatively, the non aqueous electrolyte partially comprises the solid electrolyte. The solid electrolyte is a gel polymer electrolyte comprising a polymer and an electrolyte containing a **lithium** salt. A **surface roughness** (Ra) of a surface of the **current collector** is at least 0.2 **microns**

METALLURGY - Preferred Materials: The **current**

**collector** is a copper foil, a copper alloy foil or a metal foil having a copper layer or a copper alloy layer on a surface. The copper may be electrolytic copper. The active material is silicon, tin, germanium, aluminum, or an alloy. The mean diameter of the active material particles is at most 10  $\mu\text{m}$ . Preferred Method: The active material is formed by sintering, under a non-oxidizing atmosphere, a slurry comprising particles of the active material and a binder (2b) applied on the surface of the **current collector**. The binder remains after sintering. An electrically conductive powder is mixed in the slurry and included in the active material layer. The active material layer may be formed by coating the slurry on the **current collector**, drying the slurry, rolling the dried slurry and then sintering. The active material layer is deposited on the **current collector** as a thin film.

POLYMERS - Preferred Polymers: The polymer is a polyether solid polymer, polycarbonate solid polymer, polyacrylonitrile solid polymer, copolymers of at least two of these polymers, or crosslinked polymers. The binder is a polyimide.

FILE SEGMENT: CPI; EPI  
 MANUAL CODE: CPI: A12-E06; L03-E01B5  
 EPI: X16-E01E; X16-E08A; X16-E09

L38 ANSWER 37 OF 63 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN  
 ACCESSION NUMBER: 2004-355076 [33] WPIX  
 DOC. NO. CPI: C2004-135163 [33]  
 DOC. NO. NON-CPI: N2004-283739 [33]  
 TITLE: **Negative electrode for lithium secondary battery, is prepared by forming and sintering active material layer comprising active material particles of silicon and/or silicon alloy and binder on current collector**  
 DERWENT CLASS: A85; G02; L03; P42; X16  
 INVENTOR: FUKUI A; KUSUMOTO Y; SUGISAWA M; TARUI H; TORIMAE M  
 PATENT ASSIGNEE: (FUKU-I) FUKUI A; (KUSU-I) KUSUMOTO Y; (SAOL-C) SANYO ELECTRIC CO LTD; (TARU-I) TARUI H; (TORI-I) TORIMAE M  
 COUNTRY COUNT: 2

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 20040062991	A1	20040401	(200433)*	EN	9[3]	
JP 2004127535	A	20040422	(200433)	JA	13	

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20040062991	A1	US 2003-673348	20030930
JP 2004127535	A	JP 2002-285742	20020930

PRIORITY APPLN. INFO: JP 2002-285742 20020930

INT. PATENT CLASSIF.:

IPC RECLASSIF.: B05D0003-02 [I,A]; B05D0003-02 [I,C]; H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-04 [I,A]; H01M0004-04 [I,C]; H01M0004-38 [I,A]; H01M0004-38 [I,C]; H01M0004-58 [I,A]; H01M0004-58 [I,C]; H01M0004-62

[I,A]; H01M0004-62 [I,C]; H01M0004-66 [I,A];  
H01M0004-66 [I,C]

## BASIC ABSTRACT:

US 20040062991 A1 UPAB: 20050528

**NOVELTY** - A **negative electrode** is prepared by forming an active material layer comprising active material particles of silicon and/or a silicon alloy and a binder on a **current collector** comprising an electrically conductive metal foil, and sintering the active material layer on the **current collector** under a non-oxidizing atmosphere.

**DETAILED DESCRIPTION** - A **negative electrode** for a lithium secondary battery, is prepared by forming an active material layer comprising active material particles of silicon and/or a silicon alloy and a binder on a **current collector** (6, 7) comprising an electrically conductive metal foil, and sintering the active material layer on the **current collector** under a non-oxidizing atmosphere. The active material particles are primary particles having a mean diameter of at least 1 **microns**. The primary particles are dispersed uniformly in the active material layer, and the primary particles and the binder are uniformly mixed and distributed. **INDEPENDENT CLAIMS** are also included for:

(a) a method of preparing the inventive **negative electrode** for a lithium secondary battery comprising preparing a slurry containing the active material in a binder solution, coating the slurry on a **current collector** comprising a metal foil to form an active material layer, and sintering the active material under a non-oxidizing atmosphere; and

(b) a lithium secondary battery comprising the inventive **negative electrode** (2), a positive electrode (1) comprising a positive active material, and a non aqueous electrolyte.

**USE** - For a lithium secondary battery.

**ADVANTAGE** - The invention enhances the internal strength of an electrode and improves **current collectability** to provide a **negative electrode** for a lithium secondary battery having an excellent charge and discharge cycle characteristics.

**DESCRIPTION OF DRAWINGS** - The figure shows a cross section of the batteries.

Positive electrode (1)

**Negative electrode** (2)

**Current collector** (6, 7)

Insulation packing (8)

## TECHNOLOGY FOCUS:

**ELECTRICAL POWER AND ENERGY** - Preferred Component: The **current collector** is copper foil, copper alloy foil, or a metal foil having a copper layer or copper alloy layer on its surface. It can be an electrolytic copper foil, an electrolytic copper alloy foil or a metal having an electrolytic copper layer or electrolytic copper alloy layer on its surface. Preferred Method: An electrolytic-conductive powder is mixed in the active material layer. Preferred Property: The **surface roughness** of a **surface** of the **current collector** is at least 0.2 **microns**.

**INORGANIC CHEMISTRY** - Preferred Component: The active material is silicon.

**POLYMERS** - Preferred Component: The binder is polyimide.

## FILE SEGMENT:

CPI; GMPI; EPI

## MANUAL CODE:

CPI: A05-J01B; A12-E06A; G02-A05B; L03-E01B5B

EPI: X16-B01F1; X16-E08A

L38 ANSWER 38 OF 63

WPIX COPYRIGHT 2007

THE THOMSON CORP on STN

ACCESSION NUMBER:

2004-701962 [69] WPIX

DOC. NO. CPI:

C2004-248289 [69]

DOC. NO. NON-CPI:

N2004-556639 [69]

TITLE: **Negative electrode** for use in  
 fabricating rechargeable **lithium** battery  
 has metal foil **current collector**  
 with projections and recesses on its surface

DERWENT CLASS: L03; X16

INVENTOR: FUKUI A; KUSUMOTO Y; TARUI H; TORIMAE M; TORISAKI M

PATENT ASSIGNEE: (FUKU-I) FUKUI A; (KUSU-I) KUSUMOTO Y; (SAOL-C) SANYO  
 ELECTRIC CO LTD; (TARU-I) TARUI H; (TORI-I) TORIMAE M

COUNTRY COUNT: 36

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
EP 1463133	A2	20040929	(200469)*	EN	14	[7]
JP 2004296386	A	20041021	(200469)	JA	14	
US 20040191631	A1	20040930	(200469)	EN		
CN 1534813	A	20041006	(200506)	ZH		
KR 2004086590	A	20041011	(200512)	KO		
CN 1278440	C	20061004	(200716)	ZH		

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
EP 1463133	A2	EP 2004-7333	20040326
JP 2004296386	A	JP 2003-90502	20030328
CN 1534813	A	CN 2004-10007856	20040303
US 20040191631	A1	US 2004-809848	20040326
KR 2004086590	A	KR 2004-20955	20040327
CN 1278440	C	CN 2004-10007856	20040303

PRIORITY APPLN. INFO: JP 2003-90502 20030328

## INT. PATENT CLASSIF.:

MAIN: H01M004-70

IPC ORIGINAL: H01M0004-64 [I,A]; H01M0004-64 [I,C]

IPC RECLASSIF.: B05D0005-12 [I,A]; B05D0005-12 [I,C]; H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-04 [I,A]; H01M0004-04 [I,C]; H01M0004-36 [I,A]; H01M0004-36 [I,C]; H01M0004-38 [I,A]; H01M0004-38 [I,C]; H01M0004-58 [I,A]; H01M0004-58 [I,C]; H01M0004-62 [I,A]; H01M0004-62 [I,C]; H01M0004-64 [I,A]; H01M0004-64 [I,C]; H01M0004-70 [I,A]; H01M0004-70 [I,C]

## BASIC ABSTRACT:

EP 1463133 A2 UPAB: 20050706

NOVELTY - **Negative electrode** comprises **anode** mix layer, particles of active material with silicon and/or its alloy and metal foil **current collector** (1). The **negative electrode** is made by sintering **anode** mix layer and particles of active material on **current collector** surface at non-oxidizing atmosphere. The metal foil **current collector** has projections (2) and recesses on its surface (1a). The projection is shaped to have re-curved side face portion (2a).

DETAILED DESCRIPTION - A **negative electrode** comprises **anode** mix layer, particles of active material containing silicon and/or its alloy, and metal foil **current collector**. The **negative electrode** is made by sintering **anode** mix layer and particles of active material on a surface of **current collector** at non-oxidizing atmosphere. The metal foil **current collector** has projection and recesses on its surface. The projection is shaped to have a re-curved side face portion. The side face portion curves more outwardly as it extends closer

to a distal end of the projection. The **anode** mix layer contains binder. The binder penetrates into spaces defined by the re-curved side face portions.

An INDEPENDENT CLAIM is included for fabricating **negative electrode** comprising providing metal foil **current collector**, providing **anode** mix on metal foil **current collector** and sintering the **anode** mix layer under non-oxidizing atmosphere while placing it on the surface of the metal foil **current collector**.

USE - Fabricating rechargeable **lithium** battery (claimed).

ADVANTAGE - Suppresses reduction of **current collecting** capacity in the electrode. It improves cycle performance characteristics.

DESCRIPTION OF DRAWINGS - The figure shows a section of the projection on **current collector**.

Metal foil **current collector** (1)

Surface (1a)

Projections (2)

Re-curved side face portion (2a) TECHNOLOGY FOCUS:

ELECTRICAL POWER AND ENERGY - Preferred Components: The projection is shaped to include a narrow portion defining the re-curved side face portion. The particles of active material penetrate into the spaces defined by the re-curved side face portions. The electrolytic metal is copper (alloy). The binder remains under composed after heat treatment for sintering. The binder is a polyimide. The particles of active material comprise silicon particles. The electrically conductive powder is loaded in the **anode** mix layer.

Preferred Properties: The **current collector** has **surface roughness** of at least 0.2 microns.

Preferred Methods: The **current collector** is made by subjecting electrolytic metal to a **surface roughening** treatment by an electroplating process. The **surface roughening** treatment by electroplating process is cover plating. The **anode** mix layer can be provided on the surface of the **current collector** by dispersing the particles of active material in solution of binder to prepare slurry and applying the slurry onto the surface of **current collector**.

FILE SEGMENT: CPI; EPI  
MANUAL CODE: CPI: L03-E01B5B  
EPI: X16-B01F1; X16-E01; X16-E02; X16-E08A

L38 ANSWER 39 OF 63 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN  
ACCESSION NUMBER: 2004-048610 [05] WPIX  
DOC. NO. CPI: C2004-019980 [05]  
DOC. NO. NON-CPI: N2004-039802 [05]  
TITLE: Rechargeable **lithium** ion battery for  
elective vehicle, has acetylene black thin film  
portion at electrode active material application  
edge, which has specific **surface**  
**roughness** within preset length  
DERWENT CLASS: L03; X16; X21  
INVENTOR: TASAI H  
PATENT ASSIGNEE: (NIST-C) JAPAN STORAGE BATTERY CO LTD  
COUNTRY COUNT: 1

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
JP 2003346789	A	20031205	(200405)*	JA	8[6]	

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
JP 2003346789	A	JP 2002-158248	20020530

PRIORITY APPLN. INFO: JP 2002-158248 20020530

INT. PATENT CLASSIF.:

IPC RECLASSIF.: H01M0010-04 [I,A]; H01M0010-04 [I,C]; H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-62 [I,A]; H01M0004-62 [I,C]

## BASIC ABSTRACT:

JP 2003346789 A UPAB: 20050527

NOVELTY - **Anode** (1a) has an active material compound material application edge which includes a thin film portion of acetylene black. The acetylene black thin film has **surface** with **roughness** of 20 **microns** or greater than difference of roughness elevations of portions on the film within a length of 1 mm.

USE - Rechargeable **lithium** ion battery for electric vehicle.

ADVANTAGE - The battery with heat radiation property and ensuring safety, is realized.

DESCRIPTION OF DRAWINGS - The figure shows a perspective view of connection structure of electric power generation component of rechargeable **lithium**-ion battery. (Drawing includes non-English language text).

electric power-generation component (1)

**anode** (1a)

cathode (1b)

**current collection** correction portion (2)

connection unit (2a)

convex unit (2b)

terminal (3)

FILE SEGMENT: CPI; EPI

MANUAL CODE: CPI: L03-E01B5; L03-H05

EPI: X16-B01F; X16-E01E; X16-E09; X21-A01F; X21-B01A

L38 ANSWER 40 OF 63 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN

ACCESSION NUMBER: 2001-464928 [50] WPIX

CROSS REFERENCE: 2001-464927; 2001-482921

DOC. NO. CPI: C2001-140324 [50]

DOC. NO. NON-CPI: N2001-344884 [50]

TITLE: **Anode**/separator assembly production for electrochemical cell involves forming **anode** active layer in desired pattern on microporous separator layer on carrier substrate which is then removed

DERWENT CLASS: A85; L03; X16

INVENTOR: CARLSON S A

PATENT ASSIGNEE: (MOLT-N) MOLTECH CORP

COUNTRY COUNT: 92

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 2001039301	A2	20010531	(200150)*	EN	99[12]	
AU 2001019270	A	20010604	(200153)	EN		

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2001039301	A2	WO 2000-US32140	20001121
AU 2001019270	A	AU 2001-19270	20001121

## FILING DETAILS:

PATENT NO	KIND	PATENT NO
AU 2001019270	Based on	WO 2001039301

PRIORITY APPLN. INFO: US 1999-167149P 19991123

INT. PATENT CLASSIF.:

IPC RECLASSIF.: H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0002-16 [I,A]; H01M0002-16 [I,C]; H01M0004-58 [N,A]; H01M0004-58 [N,C]; H01M0006-04 [N,C]; H01M0006-10 [N,A]; H01M0006-16 [N,A]; H01M0006-16 [N,C]

## BASIC ABSTRACT:

WO 2001039301 A2 UPAB: 20050526

NOVELTY - An **anode**/separator assembly comprising an **anode** active layer (201) and microporous separator layer (102) is formed by coating a separator layer on a temporary carrier substrate (2) and coating an **anode** active layer, in a desired pattern, on surface of the separator layer. The temporary carrier substrate is removed from the separator layer surface, to form the assembly.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(i) the production of an electrochemical cell in which an **anode**/separator assembly comprising an **anode** active layer in a predetermined pattern on a microporous separator layer is positioned with a cathode, an **anode current collector** layer and an interposing electrode insulating layer, and an electrolyte is contained in the pores of the separator layer, where the separator layer of **anode**/separator assembly is positioned face to face with the cathode and the surface of **anode** active layer is arranged face to face with **anode current collector** layer;

(ii) an electrochemical cell; and

(iii) an **anode**/separator assembly of an electrochemical cell.

USE - For primary and secondary electrochemical cells (claimed). The method is also useful for other applications such as the preparation of ink jet ink-receptive media and filtration materials.

ADVANTAGE - Electrochemical cells having separators with ultra-fine pores and with reduced thickness of less than 15 **microns** are formed, by coating, without undesirable chemical reactions and formation of cracking or other non-uniformities in the separator that may lead to short circuiting. The method overcomes the limitation in preparing microporous xerogel and other coatings, which are subject to high level of stresses and potential cracking and which are difficult to obtain at desired quality level when coated on **rough/non-uniform surfaces**, or which have poor mechanical strength and flexibility properties. The substrate has the smoothness, mechanical strength, flexibility and porosity that are desirable for the preparation of the microporous separator layer, and also have suitable release properties for removal of temporary substrate. The process is particularly useful when the protective layer is thin (less than 2 **microns**), and when the separator layer comprises one or more xerogel layers. The protective layer has barrier materials impregnated into pores of xerogel layers, to increase cycle life of cells by protecting **lithium** against degradation, and to increase the manufacturability and reliability of the cell by mechanically protecting separator and cathode layers against cracking/breaking during cell fabrication and usage. The nano-porous structure of xerogel layer may function as an ultra filtration membrane by preventing undesired penetration of pigments and other

materials into separator layer, and selectively permitting diffusion of low molecular weight materials. The tiny pores of xerogel layers enhance the capability of separators to imbibe electrolytic liquids readily. The overall cost, performance properties of microporous separator layer and ease of manufacturing are enhanced by controlling thickness of separator layer in 5-15 **microns**. The temporary carrier substrate after removal, may be reused for another assembly, another product application or reclaimed and recycled.

DESCRIPTION OF DRAWINGS - The figure shows representative process flow diagram of preparation of **anode**/separator assembly.

Carrier substrate (2)

Microporous separator coating process (50)

**Anode** active layer coating process (60)

Carrier substrate removing process (70)

Microporous separator layer (102)

**Anode** active layer (201) TECHNOLOGY FOCUS:

INORGANIC CHEMISTRY - Preferred Process: A protective coating is formed on the separator layer surface, on which the **anode** active layer is formed. The protective coating is a single ion conducting layer, impervious to dimethoxyethane (DME) and/or 1,3-dioxolane. A second protective coating may be coated on the first coating, before forming the **anode** active layer. The carrier substrate is a flexible web substrate of paper, polymeric film or metals. The **anode** active layer comprises active material such as lithium metal, lithium-aluminum alloys, lithium-tin alloys, lithium-intercalated carbons or lithium-intercalated graphites. An edge insulating layer is formed on surface of separator layer in a desired pattern comprising an insulating, non-porous polymeric layer. The cathode active layer comprises electro-active metal chalcogenides, electro-active conductive polymers and/or sulfur containing material. The cathode active layer also comprises elemental sulfur or a sulfur containing organic polymer comprising in its oxidized state, polysulfide moieties such as  $-Sm$ ,  $-Sm-$ , or  $Sm2-$ , where m at least 3. An electrode insulating layer is formed an **anode current collecting** layer comprising a polymeric coating. The electrolyte comprises liquid, gel polymer, solid polymer and/or single ion conducting electrolytes. The electrochemical cell is a primary or secondary cell. The protective layer also comprises a metal that blends with, inter-diffuses into, or forms an alloy with lithium, such as copper. Preferred Cell: A cell comprising a casing and a multi-layer cell stack is formed by providing a laminar combination of a cathode assembly and an **anode**/separator assembly, and winding the combination to form a multi-layer cell stack. An electrolyte is provided, to be contained in the separator layer of the cell stack and the multi-layer cell stack is mounted on a casing and sealed.

POLYMERS - Preferred Polymer: The protective coating layers comprise electrically- or ionically-conductive polymers, sulfonated polymers or hydrocarbon polymers, preferably ionically conductive polymers such as polydivinyl-poly(ethylene glycol), and sulfonated polymers such as sulfonated polystyrene. Further, the protective coating comprises a microporous xerogel layer, comprising an oxide such as pseudo-boehmite, zirconium oxide, titanium oxide, aluminum oxide, silicon oxide or tin oxide. The separator layer comprises one or more microporous xerogel layers.

#### EXTENSION ABSTRACT:

EXAMPLE - A coating mixture for a microporous separator layer was prepared by adding 17.5 g of a 4 weight% solution of AIRVOL 125 (polyvinyl alcohol) in water, to 10 g of a 7 weight% solids solution of CATALOID AS-3 (boehmite sol) in water, and stirring. 0.014 g of ZONYL



FSO-100 (a non-ionic fluoro-chemical compound) was added with stirring to make the sol gel separator coating. The coating was formed on a non-treated surface of 23 **microns** thick polyethylene terephthalate (PET) film MELINEX 6328 (substrate). The separator coating had good wetting on temporary carrier substrate and had increased release properties. A uniform smooth microporous xerogel layer of thickness 7 **microns** was formed on the PET film, and a second xerogel layer was formed on the first to a total dry thickness of 14 **microns**. The porosity of the xerogel separator layer was 50%. A protective coating layer containing 0.3 g of dimethoxyethane (DME):**lithium** tetrafluoro borate molecular complex in 10 g of polyethylene glycol divinyl ether, was coated to fill the pores of 1 **microns** of xerogel separator layer, and cured at 130 degrees C for 2 minutes, to crosslink the monomer. The coating layer was found to be impervious to penetration by DME, 1,3-dioxolane and their blends. A **lithium anode** active layer of narrower width was vacuum deposited on the protective coating to a thickness of 8 **microns**. The resulting composite was delaminated from the PET film to form a free standing **anode**/separator assembly. The assembly was suitable for combining with a cathode. An organic liquid electrolyte such as 1.4 M solution of **lithium** imide in a 42:58 volume ratio mixture of 1,3-dioxolane and DME, and an **anode current collector** such as nickel foil, were laminated to the **anode**/separator assembly-cathode combination to form an electrochemical rechargeable cell. The cell showed initial specific capacity of more than 400 mAh/g based on weight of elemental sulfur and showed more than 20% increase in cycle life to a cut off of specific capacity of 320 mAh/g in comparison to a cell without the protective coating layers. The free standing assembly had increased mechanical strength and flexibility without breaking, in comparison to an assembly without the protective coating layer.

FILE SEGMENT: CPI; EPI  
 MANUAL CODE: CPI: A12-E06B; A12-E09; A12-H04; A12-W07F; L03-E01A;  
 L03-E01B8  
 EPI: X16-B01F1; X16-E01; X16-F02

L38 ANSWER 41 OF 63 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN  
 ACCESSION NUMBER: 2000-423133 [36] WPIX  
 DOC. NO. CPI: C2000-128015 [36]  
 DOC. NO. NON-CPI: N2000-315786 [36]  
 TITLE: Highly-safe **lithium** storage battery with  
 high energy density, superior electrical  
 charge-discharge cycle performance, and prevention of  
 circuit by dendrite produced from **negative  
 electrode**, applicable e.g. in electric cars

DERWENT CLASS: A85; L03; X16  
 INVENTOR: OTA N; OTA Y; YAMANAKA S  
 PATENT ASSIGNEE: (SUME-C) SUMITOMO ELECTRIC IND CO; (SUME-C) SUMITOMO  
 ELECTRIC IND LTD  
 COUNTRY COUNT: 22

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 2000033409	A1	20000608	(200036)*	JA	41[1]	
EP 1052718	A1	20001115	(200059)	EN		
JP 2000340257	A	20001208	(200104)	JA	15	

US 6365300	B1	20020402 (200226)	EN
JP 2004247317	A	20040902 (200457)	JA 14
JP 3578015	B2	20041020 (200469)	JA 22

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2000033409	A1	WO 1999-JP6668	19991129
JP 2000340257	A	JP 1999-307717	19991028
JP 2004247317	A Div Ex	JP 1999-307717	19991028
JP 3578015	B2	JP 1999-307717	19991028
EP 1052718	A1	EP 1999-973180	19991129
EP 1052718	A1	WO 1999-JP6668	19991129
US 6365300	B1	WO 1999-JP6668	19991129
US 6365300	B1	US 2000-601498	20000915
JP 2004247317	A	JP 2004-128150	20040423

## FILING DETAILS:

PATENT NO	KIND	PATENT NO
JP 3578015	B2	Previous Publ JP 2000340257 A
EP 1052718	A1	Based on WO 2000033409 A
US 6365300	B1	Based on WO 2000033409 A

PRIORITY APPLN. INFO: JP 1999-78733 19990324  
 JP 1998-344593 19981203  
 JP 1999-7736 19990114

## INT. PATENT CLASSIF.:

## IPC RECLASSIF.:

H01M0010-36 [I,A]; H01M0010-36 [I,A]; H01M0010-36 [I,C]; H01M0010-36 [I,C]; H01M0010-36 [I,C];  
 H01M0010-40 [I,A]; H01M0010-40 [I,A]; H01M0002-16 [N,A]; H01M0002-16 [N,C]; H01M0004-02 [I,A];  
 H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-02 [I,C]; H01M0004-36 [I,C]; H01M0004-40 [N,A];  
 H01M0004-40 [N,C]; H01M0004-58 [I,A]; H01M0004-58 [I,C]; H01M0004-60 [I,A]; H01M0004-62 [I,A];  
 H01M0004-62 [I,C]; H01M0006-18 [N,A]; H01M0006-18 [N,C]

## BASIC ABSTRACT:

WO 2000033409 A1 UPAB: 20060116

NOVELTY - A highly-safe **lithium** storage battery comprises an electrolyte layer, a positive electrode and a **negative electrode** made from a **lithium** -containing material, in which the electrolyte layer is composed of an inorganic solid electrolyte and a positive electrode contains an organic polymer.

USE - The secondary batteries are particularly applicable in portable communication systems, note-pad PCs and electric cars.

ADVANTAGE - Such batteries are highly safe, with high capacitance, high energy density, superior electrical charge-discharge cycle performance, and prevention of circuit by dendrite produced from **negative electrode**.

DESCRIPTION OF DRAWINGS - Expanded cross-sectional view of the main parts of the **lithium** storage battery.

**Current collectors** (1, 6)

positive electrode (2)

separator (3)

solid electrolyte thin film (4)

**negative electrode** (5) TECHNOLOGY FOCUS:

ELECTRICAL POWER AND ENERGY - Preferred Materials: The

electrolyte layer has a **lithium** ion conductivity of not less than  $1 \times 10^{-5}$ , particularly not less than  $5 \times 10^{-5}$ , S/cm at 25 degrees C, which is a non-crystalline body. The composition of the electrolyte layer contains at least 1 element chosen from a group consisted of oxygen, nitrogen, sulfide and oxynitride. The sulfide can be 1 or more of  $\text{Li}_2\text{S}$ ,  $\text{Li}_2\text{S}$  and  $\text{SiS}_2$ ,  $\text{GeS}_2$ , and  $\text{Ga}_2\text{S}_3$ , while the oxynitride from at least 1 of  $\text{LiPO}_4\text{-XN}_2\text{X}/3$ ,  $\text{Li}_4\text{SiO}_4\text{-XN}_2\text{X}/3$ ,  $\text{LiGeO}_4\text{-N}_2\text{X}/3$  (where 0 not more than X not more than 4), and  $\text{Li}_3\text{BO}_3\text{-XN}_2\text{X}/3$  (where 0 not more than X not more than 3).

Such electrolyte layer particularly contains the following composition: (A) a 30-65 atom% Li composition; (B) 1 or more elements selected from phosphorus, silicon, boron, germanium and gallium; and (C) sulfur. Furthermore, the electrolyte layer may also contain oxygen or/and nitrogen. The electrolyte layer is 50 nm to 50 microns in thickness. Such electrolyte layer constitutes the 2 layers of the positive electrode side layer and the **negative electrode** side layer. The **negative electrode** side layer is a thin film of a **lithium** conductive compound containing a sulfide, while the positive electrode side layer is a thin film of a **lithium** ion conductive composition containing an oxide. Thickness of electrolyte layer made from the 2 layers is 2-22 microns. The **negative electrode** side layer particularly contains **lithium** sulfide and silicon sulfide, while the positive electrode side layer contains a phosphate or/and titanium oxide.

Preferably, the positive electrode side layer contains the following composition: (A) a 30-50 atom% Li composition; (B) phosphorus; and (C) oxygen or/and nitrogen. Thickness of the positive electrode side layer is 1-50% of that of the **negative electrode** side layer, with the thickness of the positive electrode side layer being 10 nm to 25 microns. The positive electrode contains **lithium** ion conductive solid electrolyte particles with ion conductivity of not less than  $10^{-3}$  S/cm. The organic polymer of the positive electrode is a polyaniline-containing disulfide polymer with **lithium** salt of  $\text{LiPF}_6$  or  $\text{LiCF}_3\text{SO}_3$ .

The positive electrode contain an organic electrolyte solution, and its **lithium** ion conductivity is lower than that of the inorganic solid electrolyte of the electrolyte layer. The organic electrolyte solution of the positive electrode is in contact with the **lithium**-containing material of the **negative electrode**, and the ion conductivity of the organic electrolyte solution at vicinity of the contacting part is lower than that of the inorganic solid electrolyte.

Particularly, the organic solvent composition of the organic electrolyte solution of the positive electrode is in contact with the **lithium**-containing material of the **negative electrode**, and vicinity of the contacting part is gasified, or solidified, or the viscosity of the electrolyte solution at vicinity of the contacting part is higher.

Such organic solvent composition in the organic electrolyte solution of the positive electrode especially contains sulfolane, or linear carboxylates, or nitrile group-containing compound or/and compound with olefin linkage. **Surface roughness** of the **negative electrode**,  $R_{\text{max}}$  value, is 0.01-5 microns.

A metal layer is formed from **lithium** and alloy or inter-metallic compound at the electrolyte layer side of the **negative electrode**, and such **negative electrode** is preferably a multiple layer or an incline

composition. Surface of the **negative electrode** does not have an oxide layer but a sulfide or nitride layer, or is formed with an electrolyte layer with an oxide layer in between or directly. The positive electrode is provided with a **current collector**, and in the lithium-containing material **negative electrode**, an electrolyte layer is directly formed on the **current collector** of the **negative electrode**.

## EXTENSION ABSTRACT:

EXAMPLE - A copper foil (100 x 50 mm x 100 **microns** thickness) and a **lithium** metal foil of the same dimension but 50 **microns** in thickness were fixed together and rolled to provide a desirable **lithium surface roughness** and also heated to close to the melting point of **lithium** metal for better bonding to  $R_{max} = 0.1$  **microns**. Onto the **lithium** metal, a thin film of  $Li_2S/SiS_2/Li_4SiO_4$  was RF magnetron-sputtered under nitrogen as a solid electrolyte film (10 **microns** in thickness), molar ratio of Li:Si:N:O:S being 0.42:0.13:0.01:0.01:0.43. A mixture of ethylene carbonate and propylene carbonate was heated with polyacrylonitrile to give a solution before cooling, dissolving  $LiPF_6$  in it and adding electroactive material of  $LiCoO_2$  particles and conductive carbon particles. The mixture was coated onto a 100 **microns** aluminum foil to a thickness of 300 **microns** as the positive electrode. The solid electrolyte film-formed **lithium** metal was connected with the positive electrode for making a battery with a lead wire sealed into the protruding aluminum laminate. Results of the evaluation study were: at charging voltage of 4.2 V and discharging voltage of 3 V, capacitance = 0.5 Ah; energy density = 490 Wh/l; and after 1000 cycles, no dendrite formation due to the **lithium** metal **negative electrode**, and no gas evolution.

FILE SEGMENT: CPI; EPI  
 MANUAL CODE: CPI: A12-E06A; L03-E01B; L03-E01C; L03-H05  
 EPI: X16-B01X; X16-E01A1; X16-E01C; X16-J01C

L38 ANSWER 42 OF 63 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN  
 ACCESSION NUMBER: 1999-172491 [15] WPIX  
 DOC. NO. CPI: C1999-050375 [15]  
 DOC. NO. NON-CPI: N1999-126510 [15]  
 TITLE: Electrodes for non-aqueous secondary batteries  
 DERWENT CLASS: A14; A17; A85; L03; X16  
 INVENTOR: FUNAKI A; ICHIKUNI N; SAITO M  
 PATENT ASSIGNEE: (ASAG-C) ASAHI GLASS CO LTD  
 COUNTRY COUNT: 1

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
JP 11025987	A	19990129	(199915)*	JA	5[0]	

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
JP 11025987	A	JP 1997-176170	19970701

PRIORITY APPLN. INFO: JP 1997-176170 19970701  
 INT. PATENT CLASSIF.:

IPC RECLASSIF.: C08F0214-00 [I,C]; C08F0214-22 [I,A]; C08F0214-26 [I,A]; H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-62 [I,A]; H01M0004-62 [I,C]

## BASIC ABSTRACT:

JP 11025987 A UPAB: 20050521

A new electrode for non-aqueous secondary batteries contains electrode active material and a specific binder. The binder is a copolymer that contains tetrafluoroethylene unit, vinylidene fluoride unit, propylene unit, and the unit (XYRf) of formula (1), (2), (3).

X-Rf-CY=CH<sub>2</sub> (1)

X-Rf-OCF=CF<sub>2</sub> (2)

CF<sub>3</sub>(CF<sub>3</sub>)<sub>n</sub>-(OCF(CF<sub>3</sub>)CF<sub>2</sub>)<sub>m</sub>-OCF=CF<sub>2</sub> (3)

Y = H or F;

Rf = 2-12C fluorine-substituted organic gp;

X = F, Cl, or H;

n = an integer of 0-3;

m = an integer of 1-4.

A new non-aqueous secondary battery is also claimed, which comprises positive electrode, **negative electrode**, lithium salt, and non-aqueous solvent dissolving the lithium salt. The positive and/or negative electrodes contain the new specific binder.

USE - For non-aqueous secondary batteries, especially, lithium ion secondary batteries.

ADVANTAGE - The electrode is less swollen with electrolyte solution at high temps. The binder provides good adhesion to metallic **current collectors**.

## DOCUMENTATION ABSTRACT:

JP11025987

A new electrode for non-aqueous secondary batteries contains electrode active material and a specific binder. The binder is a copolymer that contains tetrafluoroethylene (TFE) unit, vinylidene fluoride (VDF) unit, propylene (PP) unit, and the unit (XYRf) of formula (1), (2), (3).

X-Rf-CY=CH<sub>2</sub> (1)

X-Rf-OCF=CF<sub>2</sub> (2)

CF<sub>3</sub>(CF<sub>3</sub>)<sub>n</sub>-(OCF(CF<sub>3</sub>)CF<sub>2</sub>)<sub>m</sub>-OCF=CF<sub>2</sub> (3)

Y = H or F;

Rf = 2-12C fluorine-substituted organic gp;

X = F, Cl, or H;

n = an integer of 0-3;

m = an integer of 1-4.

A new non-aqueous secondary battery is also claimed, which comprises positive electrode, **negative electrode**, lithium salt, and non-aqueous solvent dissolving the lithium salt. The positive and/or negative electrodes contain the new specific binder.

USE

For non-aqueous secondary batteries, especially, lithium ion secondary batteries.

ADVANTAGE

The electrode is less swollen with electrolyte solution at high temps. The binder provides good adhesion to metallic **current collectors**.

EXAMPLE

A binder solution was prepared by dissolving 2.0 pts.weight TFE-IB-PP-PFBE copolymer (48/40/10/2 by mol; PFBE = perfluorobutylethylene) in a mixed solvent of 24 pts.weight of ethylacetate and 5 pts.weight of methylisobutylketone; adding 18 pts.weight

of methylcellosolve to the binder solution An electrode mixture containing 91.5 pts.weight LiCoO<sub>2</sub> with an average dia. of 8 **microns**, 0.5 pts.weight of acetylene black, and 6.0 pts.weight of graphite powder was added to the binder solution The resultant mixt was coated in 120 **micron** thick on a 15 **micron** thick Al foil with **roughened surface** with a doctor blade; the coating was dried at 120 deg.C to obtain a positive electrode.

## PREFERRED

TFE unit is contained in 30-85 mol%, VDF unit is in 5-68.5 mol%, PP unit is in 1-30 mol%, and XYRf unit is in 0.05-20 mol%. The binder is contained in 1-20 pts.weight w.r.t. 100 pts.weight of electrode active material.

FILE SEGMENT: CPI; EPI  
 MANUAL CODE: CPI: A04-E09; A04-E10; A12-E06A; L03-E01B5  
 EPI: X16-B01F1; X16-E09

L38 ANSWER 43 OF 63 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN  
 ACCESSION NUMBER: 1999-172489 [15] WPIX  
 DOC. NO. CPI: C1999-050373 [15]  
 DOC. NO. NON-CPI: N1999-126508 [15]  
 TITLE: Electrode for non-aqueous secondary batteries - includes binder which is copolymer containing tetra:fluoroethylene, isobutylene\* and propylene@\* units  
 DERWENT CLASS: A14; A17; A85; L03; X16  
 INVENTOR: FUNAKI A; ICHIKUNI N; SAITO M  
 PATENT ASSIGNEE: (ASAG-C) ASAHI GLASS CO LTD  
 COUNTRY COUNT: 1

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
JP 11025985	A	19990129	(199915)*	JA	4	[0]

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
JP 11025985	A	JP 1997-172478	19970627

PRIORITY APPLN. INFO: JP 1997-172478 19970627

## INT. PATENT CLASSIF.:

IPC RECLASSIF.: C08F0214-00 [I,C]; C08F0214-26 [I,A]; H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-62 [I,A]; H01M0004-62 [I,C]

## BASIC ABSTRACT:

JP 11025985 A UPAB: 20050521

A new electrode for non-aqueous secondary batteries contains electrode active material and a specific binder. The binder is a copolymer that contains tetrafluoroethylene (TFE) unit, isobutylene (IB) unit, and propylene (PP) unit.

A new non-aqueous secondary battery is also claimed, which comprises positive electrode, **negative electrode**, lithium salt, and non-aqueous solvent dissolving the lithium salt. The positive and/or negative electrodes contain the new specific binder.

USE - For non-aqueous secondary batteries, especially, lithium ion secondary batteries.

ADVANTAGE - The electrode is less swollen with electrolyte solution at high temps. The binder provides good adhesion to metallic **current collectors**.

## DOCUMENTATION ABSTRACT:

JP11025985

A new electrode for non-aqueous secondary batteries contains electrode active material and a specific binder. The binder is a copolymer that contains tetrafluoroethylene (TFE) unit, isobutylene (IB) unit, and propylene (PP) unit.

A new non-aqueous secondary battery is also claimed, which comprises positive electrode, **negative electrode**, **lithium** salt, and non-aqueous solvent dissolving the **lithium** salt. The positive and/or negative electrodes contain the new specific binder.

## USE

For non-aqueous secondary batteries, especially, **lithium** ion secondary batteries.

## ADVANTAGE

The electrode is less swollen with electrolyte solution at high temps. The binder provides good adhesion to metallic **current collectors**.

## EXAMPLE

A binder solution was prepared by dissolving 2.0 pts.weight TFE-IB-PP copolymer (60/20/20 by mol) in a mixed solvent of 24 pts.weight of ethylacetate and 5 pts.weight of methyl-isobutyl-ketone; adding 18 pts.weight of methyl-cellosolve to the binder solution. An electrode mixture containing 91.5 pts.weight LiCoO<sub>2</sub> with an average dia. of 8 **microns**, 0.5 pts.weight of acetylene black, and 6.0 pts.weight of graphite powder was added to the binder solution. The resultant mixt was coated in 120 **micron** thick on a 15 **micron** thick Al foil with **roughened surface** with a doctor blade; the coating was dried at 120 °C to obtain a positive electrode. (PW)

## PREFERRED BINDER

TFE unit is contained in 20-80 mol%, IB unit is in 5-50 mol%, and PP unit is in 5-30 mol%. The binder is contained in 1-20 pts.weight w.r.t. 100 pts.weight of electrode active material.

## FILE SEGMENT:

CPI; EPI

## MANUAL CODE:

CPI: A04-E09; A04-G05; A04-G09; A12-E06A; L03-E01B  
EPI: X16-B01F; X16-E01; X16-E09

L38 ANSWER 44 OF 63

WPIX COPYRIGHT 2007

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ACCESSION NUMBER:

1993-117844 [14] WPIX

DOC. NO. CPI:

C1993-052376 [21]

DOC. NO. NON-CPI:

N1993-089803 [21]

TITLE:

New sec. cell useful as electric supply source for electronic and electric instruments - comprises. **lithium** containing composite metal oxide as **anode** active material, carbonaceous material as cathode active material, and organic electrolyte

DERWENT CLASS:

A85; L03; X16

INVENTOR:

INOUE K; KOYAMA A; KURIBAYASHI I; MINATO Y; OYAMA A; TAKIZAWA Y; YAMASHITA M; YOSHINO A

PATENT ASSIGNEE:

(ASAH-C) ASAHI CHEM IND CO LTD; (ASAH-C) ASAHI KASEI IND KK; (ASAH-C) ASAHI KASEI KOGYO KK

COUNTRY COUNT:

21

PATENT INFORMATION:

PATENT NO

KIND DATE

WEEK

LA PG

MAIN IPC

WO 9306628	A1	19930401	(199314)*	JA	41[2]
JP 05226004	A	19930903	(199340)	JA	10
TW 211084	A	19930811	(199346)#	ZH	
EP 603397	A1	19940629	(199425)	EN	22[2]
AU 9333755	A	19940915	(199438)#	EN	
AU 655710	B	19950105	(199508)#	EN	
EP 603397	A4	19950503	(199614)	EN	
CN 1092208	A	19940914	(199716)#	ZH	
US 5631100	A	19970520	(199726)	EN	13[2]
CA 2106066	C	19970812	(199746)	EN	
RU 2107360	C1	19980320	(199844)#	RU	
EP 603397	B1	19981230	(199905)	EN	
DE 69228065	E	19990211	(199912)	DE	
KR 9704141	B1	19970325	(199937)	KO	
EP 603397	B2	20021218	(200301)	EN	
CN 1057874	C	20001025	(200472)#	ZH	

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 9306628	A1	WO 1992-JP1175	19920914
EP 603397	A4	EP 1992-919519	
CA 2106066	C	CA 1992-2106066	19920914
DE 69228065	E	DE 1992-69228065	19920914
EP 603397	A1	EP 1992-919519	19920914
EP 603397	B1	EP 1992-919519	19920914
DE 69228065	E	EP 1992-919519	19920914
EP 603397	B2	EP 1992-919519	19920914
JP 05226004	A	JP 1992-269144	19920914
EP 603397	A1	WO 1992-JP1175	19920914
US 5631100	A	WO 1992-JP1175	19920914
EP 603397	B1	WO 1992-JP1175	19920914
DE 69228065	E	WO 1992-JP1175	19920914
KR 9704141	B1	WO 1992-JP1175	19920914
EP 603397	B2	WO 1992-JP1175	19920914
AU 9333755	A	AU 1993-33755	19930224
AU 655710	B	AU 1993-33755	19930224
TW 211084	A	TW 1993-101475	19930301
RU 2107360	C1	RU 1993-36962	19930304
CN 1092208	A	CN 1993-104038	19930308
CN 1057874	C	CN 1993-104038	19930308
KR 9704141	B1	KR 1993-702775	19930916
US 5631100	A	US 1993-117175	19930920

## FILING DETAILS:

PATENT NO	KIND	PATENT NO
AU 655710	B	Previous Publ
DE 69228065	E	Based on
EP 603397	A1	Based on
US 5631100	A	Based on
EP 603397	B1	Based on
DE 69228065	E	Based on
EP 603397	B2	Based on
AU 9333755	A	
EP 603397	A	
WO 9306628	A	
WO 9306628	A	
WO 9306628	A	
WO 9306628	A	
WO 9306628	A	
WO 9306628	A	

PRIORITY APPLN. INFO: JP 1991-261293 19910913  
AU 1993-33755 19930224



10/691,476

TW 1993-101475 19930301  
RU 1993-36962 19930304  
CN 1993-104038 19930308

INT. PATENT CLASSIF.:

MAIN: H01M010-20; H01M010-40  
IPC RECLASSIF.: H01M0010-36 [I,A]; H01M0010-36 [I,C]; H01M0010-36  
[I,C]; H01M0010-40 [I,A]; H01M0010-40 [I,A];  
H01M0010-42 [I,A]; H01M0010-42 [I,C]; H01M0002-20  
[N,C]; H01M0002-34 [N,A]; H01M0004-02 [I,A];  
H01M0004-02 [I,C]; H01M0004-52 [I,A]; H01M0004-52  
[I,C]; H01M0004-58 [I,A]; H01M0004-58 [I,C];  
H01M0004-62 [I,A]; H01M0004-62 [I,A]; H01M0004-62  
[I,C]; H01M0004-62 [I,C]; H01M0004-66 [I,A];  
H01M0004-66 [I,A]; H01M0004-66 [I,C]; H01M0004-66  
[I,C]; H01M0006-00 [N,C]; H01M0006-04 [N,C];  
H01M0006-10 [N,A]; H01M0006-14 [I,A]; H01M0006-14  
[I,C]; H01M0006-16 [N,A]; H01M0006-16 [N,C];  
H01M0006-50 [N,A]

BASIC ABSTRACT:

WO 1993006628 A1 UPAB: 20060107

A sec. cell comprises a positive electrode in which an Li-containing composite metal oxide is used as the active material, a **negative electrode** having carbonaceous material as the active material and an organic electrolyte filled in the container of the cell. The two active materials are isolated by a separator. The amount of water contained in the organic electrolyte is 5-450 ppm.

Pref. either the positive or the **negative electrode**, or both, are composed of a coating film layer, comprising the active material and a binder, formed on a metal **current collector** body. The binder is distributed in the coating film layer with a binder distribution coefft. of 0.5-5.0. The metal **current-collector** body is pref. metallic foil with a **surface roughness** of 0.1-0.9 **microns**. The binder is 75-100% gel and is mainly composed of styrene/butadiene latex containing 40-95 weight% of butadiene. The organic electrolyte is an ether, ketone, lactone, nitrile, amine, amide, sulphur cpd., hydrocarbon substd. with Cl, ester, or sulphoran cpd.

USE/ADVANTAGE - The sec. cell has good current efficiency, cycle characteristics, preservation characteristics and stability. It is useful as an electric supply source for electronic and electric instruments.

FILE SEGMENT: CPI; EPI  
MANUAL CODE: CPI: A12-E06A; L03-E03  
EPI: X16-B01F1; X16-E01C1

=> d 45-63 ibib abs ind

L38 ANSWER 45 OF 63 COMPENDEX COPYRIGHT 2007 EEI on STN

ACCESSION NUMBER: 2005(46):2794 COMPENDEX Full-text

TITLE: Integrated fuel cell micro power system by microfabrication technique.

AUTHOR: Xiao, Zhiyong (Department of Electrical  
Analelectronic Engineering Hong Kong University of  
Science Andtechnology, Hong Kong, Hong Kong); Yan,  
Guizhen; Feng, Chunhua; Chan, Philip C. H.; Hsing,  
I.-Ming

MEETING TITLE: 13th International Conference on Solid-State  
Sensors and Actuators and Microsystems,  
TRANSDUCERS '05.

MEETING ORGANIZER: Korean Sensors Society; IEEE Electron Devices  
Society, EDS; IEE of Japan, Sensors and  
Micromachines Society; International Federation of

Automatic Control; Institute of Control,  
Automation and Systems Engineers

MEETING LOCATION: Seoul, South Korea

MEETING DATE: 05 Jun 2005-09 Jun 2005

SOURCE: Digest of Technical Papers - International  
Conference on Solid State Sensors and Actuators  
and Microsystems, TRANSDUCERS '05 v 2 2005.p  
1856-1859, (IEEE cat n 05TH8791)

SOURCE: Digest of Technical Papers - International  
Conference on Solid State Sensors and Actuators  
and Microsystems, TRANSDUCERS '05 v 2 2005.p  
1856-1859, (IEEE cat n 05TH8791), arn: 3E4.140

SOURCE: TRANSDUCERS '05 - 13th International Conference on  
Solid-State Sensors and Actuators and Microsystems  
- Digest of Technical Papers  
ISBN: 0780389948

PUBLICATION YEAR: 2005

MEETING NUMBER: 65909

DOCUMENT TYPE: Conference Article

TREATMENT CODE: Theoretical; Experimental

LANGUAGE: English

AN 2005(46):2794 COMPENDEX Full-text

AB In this paper, we report a silicon/glass based micro fuel cell system  
fabricated by the micromachining technique. The **anode** and cathode catalyst  
layers are formed by directly sputtering platinum on the ICP-etched  
(Inductively Coupled Plasma) high-aspect-ratio columns on silicon substrate.  
Integrated gold-based micro **current collectors** are patterned on the silicon  
and glass surfaces. This prototypical micro fuel cell fed by H<sub>2</sub>/O<sub>2</sub>  
demonstrates an output power of 7.10 mW/cm<sup>2</sup>. An improved power of 12.3 mW/cm<sup>2</sup>  
is achieved by a novel etching process. Both prototypes are also tested with  
methanol/O<sub>2</sub>, and the maximum output power is 0.10 mW/cm<sup>2</sup> and 0.15 mW/cm<sup>2</sup>,  
respectively. Low internal resistance (around 0.7  $\Omega$ \*cm<sup>2</sup>) is achieved when  
using thin gold film (200 nm) as **current collectors** and the catalyst **surface  
roughness** does not affect the internal resistance. \$CPY 2005 IEEE. 10 Refs.

AN 2005(46):2794 COMPENDEX Full-text

CC 702.2 Fuel Cells; 713.5 Other Electronic Circuits; 715.2 Industrial  
Electronic Equipment; 549.3 Others (including Bismuth, Boron, Cadmium,  
Cobalt, Mercury, Niobium, Selenium, Silicon, Tellurium and Zirconium);  
812.3 Glass; 701.1 Electricity: Basic Concepts and Phenomena

CT \*Fuel cells; Catalysts; Micromachining; Aspect ratio; Electric  
resistance; Inductively coupled plasma; Power electronics;  
Microelectronics; Silicon; Glass; Electric currents; **Anodes**;  
Cathodes

ST Micro fuel cells; Integrated **current collectors**;  
Micro Pillars; Glass surfaces

ET H\*O; H<sub>2</sub>/O; H cp; cp; O cp

L38 ANSWER 46 OF 63 COMPENDEX COPYRIGHT 2007 EEI on STN

ACCESSION NUMBER: 2006(17):7840 COMPENDEX Full-text

TITLE: Effect of the shape of graphite powders on active  
surface area.

AUTHOR: Satou, Hideharu (Mitsubishi Chemical Group Science  
and Technology Research Center, Inc., Ami,  
Inashiki, Ibaraki 300-0332, Japan); Kamada,  
Tomiyuki; Ue, Makoto

MEETING TITLE: 208th Meeting of The Electrochemical Society.

MEETING LOCATION: Los Angeles, CA, United States

MEETING DATE: 16 Oct 2005-21 Oct 2005

SOURCE: Meeting Abstracts v MA 2005-02 2005.p 314

SOURCE: Meeting Abstracts v MA 2005-02 2005.p 314

SOURCE: 208th Meeting of The Electrochemical Society -  
Meeting Abstracts  
ISSN: 1091-8213  
PUBLICATION YEAR: 2005  
MEETING NUMBER: 67008  
DOCUMENT TYPE: Conference Article  
TREATMENT CODE: Theoretical; Experimental  
LANGUAGE: English

AN 2006(17):7840 COMPENDEX Full-text

AB Recently, for the purpose of designing higher capacity cells, the electrode density of **anode** becomes higher. Therefore, it is important to know the actual electroactive surface area at high electrode density which affects cell performances such as the amount of evolving gas, irreversible capacity, Li acceptability. On the other hand, it was reported that the different shape of graphite powders gave different cycling behaviors [1], This means that the electrochemical reaction on the **anode** is also affected by the powder morphology. In this study, we compared particle character and morphology at high electrode density such as 1.8 gcm<sup>-3</sup> with electrochemical result. A series of artificial graphites (AG) which have different surface areas were used for the measurements. The shape and geometrical surface area of the graphite particles were observed by SEM and BET method, respectively. The mixtures of the graphite particles and binder polymers (SBR/CMC = 1 weight%/1 weight%) were coated on a Cu **current collector**, and the resultant electrodes were pressed to 1.8 gcm<sup>-3</sup>. To estimate the electroactive surface area and resistivity, we evaluated the charge transfer resistance (R<sub>ct</sub>) and double-layer capacitance (C<sub>dl</sub>) by AC impedance method [2] at 0deg C. A simple face-to-face cell with 2-electrode configuration was used. The cell was reconstructed by a pair of charged **anodes** (1.23cm<sup>2</sup>; charging capacity 300 mAhg<sup>-1</sup> at 2nd cycle) before the impedance measurement. As showing in Table 1, C<sub>dl</sub> of graphite **anodes** are proportional to geometrical surface area as far as they belong to the same morphological category; F (flaky) or S (spherical). Although AG-4 and AG-6 showed almost the same geometrical surface area, C<sub>dl</sub> of AG-6 was smaller than that of AG-4. Thus, C<sub>dl</sub> of flaky AG is smaller than that of spherical AG. R<sub>ct</sub> did not show clear relation with the BET **surface area** but **roughly** changed with inverse proportion to C<sub>dl</sub>. It is well-known that SBR disturbs the penetration of electrolytes, resulting that the portion of graphite surface is covered by it and becomes inert. Therefore, the above different tendency in C<sub>dl</sub> is based on the different dispersion state of the binder on the powder surface because their **surface roughness** is quite different. 2 Refs.

AN 2006(17):7840 COMPENDEX Full-text

CC 702.1 Electric Batteries; 714.1 Electron Tubes; 802.2 Chemical Reactions; 701.1 Electricity: Basic Concepts and Phenomena; 931.2 Physical Properties of Gases, Liquids and Solids; 804.2 Inorganic Compounds

CT \*Electric batteries; Capacitance; Electric impedance; Charge transfer; **Surface roughness**; Artificial graphite; Electrolytes; **Anodes**

ST Active surface area; Graphite powders; Electrochemical reaction; High electrode density; **Current collectors**

ET Li; Cu; F; S

L38 ANSWER 47 OF 63 COMPENDEX COPYRIGHT 2007 EEI on STN

ACCESSION NUMBER: 2005(12):2156 COMPENDEX Full-text

TITLE: Lithiation/delithiation performance of Cu<sub>6</sub>Sn<sub>5</sub> with carbon paper as **current collector**.

AUTHOR: Arbizzani, Catia (University of Bologna Unita  
Comlessa Istituti Sci. Chim., Radiochim./M.,  
40127 Bologna, Italy); Lazzari, Mariachiara;

Mastragostino, Marina

SOURCE: Journal of the Electrochemical Society v 152 n 2  
2005.p A289-A294

SOURCE: Journal of the Electrochemical Society v 152 n 2  
2005.p A289-A294

CODEN: JESOAN ISSN: 0013-4651

PUBLICATION YEAR: 2005

DOCUMENT TYPE: Journal

TREATMENT CODE: Experimental

LANGUAGE: English

AN 2005(12):2156 COMPENDEX Full-text

AB Lithiation/delithiation of Cu<sub>6</sub>Sn<sub>5</sub> both electrochemically and mechanochemically prepared on a carbon paper (CP) **current collector** was investigated by repeated galvanostatic cycles with lime-limited charges to insert different amounts of lithium per Sn atom (Li/Sn) into the alloy. The results demonstrated that, unlike Cu<sub>6</sub>Sn<sub>5</sub> electrodeposited on Cu foil, both electrochemical and mechanochemical Cu<sub>6</sub>Sn<sub>5</sub> on CP can undergo hundreds of lithiation/delithiation cycles with Li/Sn > 2 at high current density (0.74 mA cm<sup>-2</sup>), thereby delivering constant amounts of charge with coulombic efficiency near 100%. The Cu<sub>6</sub>Sn<sub>5</sub>/CP electrodes with a loading of 6.6 mg cm<sup>-2</sup> and charge limited to 2.43 Li/Sn yielded a specific capacity of 330 mAh g<sup>-1</sup> and a capacity per geometric area of 2.18 mAh cm<sup>-2</sup>. These values compare well with those of graphite-based **anodes** of commercial **batteries**. The significant improvement in cyclability performance of the Cu<sub>6</sub>Sn<sub>5</sub>/CP electrodes is due to the CP **current collector's** three-dimensional conductive matrix, which preserves the electric contact over cycling so that alloy cracking becomes less detrimental for the electric contact. \$CPY 2004 The Electrochemical Society. 26 Refs.

AN 2005(12):2156 COMPENDEX Full-text

CC 804.2 Inorganic Components; 702.1.1 Primary Batteries; 801.4.1 Electrochemistry; 704.1 Electric Components; 931.2 Physical Properties of Gases, Liquids and Solids; 421 Strength of Building Materials. Mechanical Properties

CT \*Copper compounds; Electrochemistry; Electric contacts; Electrodes; **Surface roughness**; Delamination; Current density; Carbon; Lithium batteries

ST Carbon paper (CP); **Current collectors**; Lithiation; Delithiation; Atomic ratio

ET Cu\*Sn; Cu sy 2; sy 2; Sn sy 2; Cu<sub>6</sub>Sn; Cu cp; cp; Sn cp; Sn; Li; Cu; C\*Cu\*P\*Sn; C sy 4; sy 4; Cu sy 4; P sy 4; Sn sy 4; Cu<sub>6</sub>Sn<sub>5</sub>/CP; C cp; P cp

L38 ANSWER 48 OF 63 COMPENDEX COPYRIGHT 2007 EEI on STN

ACCESSION NUMBER: 2004(18):9011 COMPENDEX Full-text

TITLE: Electrochemical characteristics of a-Si thin film **anode** for Li-ion rechargeable batteries.

AUTHOR: Lee, Ki-Lyoung (Div. of Mat. Science and Engineering Hanyang University, Seongdong-Gu, Seoul 133-791, South Korea); Jung, Ju-Young; Lee, Seung-Won; Moon, Hee-Soo; Park, Jong-Wan

SOURCE: Journal of Power Sources v 129 n 2 Apr 22 2004  
2004.p 270-274

SOURCE: Journal of Power Sources v 129 n 2 Apr 22 2004  
2004.p 270-274

CODEN: JPSODZ ISSN: 0378-7753

PUBLICATION YEAR: 2004

DOCUMENT TYPE: Journal

TREATMENT CODE: Theoretical

LANGUAGE: English

AN 2004(18):9011 COMPENDEX Full-text

- AB Deposition of an amorphous Si (a-Si) thin film **anode** was carried out by a radio-frequency (rf) magnetron sputtering. In order to avoid mechanical disintegration of the Si electrodes, the Si was deposited on two types of Cu foil: normal Cu foil and Cu foil with a **rough surface**. The **surface** of the Cu foil was roughened with sandpaper. The properties of Si film were observed by FESEM, Raman, XRD, AFM, CLSM and electrochemical performance was evaluated. It was believed that the rough foil helped the active Si material to maintain the electronic contact with the **current collector** during charging and discharging. \$CPY 2003 Elsevier B.V. All rights reserved. 20 Refs.
- AN 2004(18):9011 COMPENDEX Full-text
- CC 714.2 Semiconductor Devices and Integrated Circuits; 549.3 Others (including Bismuth, Boron, Cadmium, Cobalt, Mercury, Niobium, Selenium, Silicon, Tellurium and Zirconium); 714.1 Electron Tubes; 702.1.2 Secondary Batteries; 801.4.1 Electrochemistry; 933.2 Amorphous Solids
- CT \*Thin films; Raman spectroscopy; Atomic force microscopy; X ray diffraction analysis; Magnetron sputtering; Deposition; Copper; Silicon; **Anodes**; Secondary batteries; Electrochemistry; Amorphous films
- ST Li-ion rechargeable battery; Micro battery
- ET Si; Cu; Li
- L38 ANSWER 49 OF 63 COMPENDEX COPYRIGHT 2007 EEI on STN
- ACCESSION NUMBER: 2005(30):9445 COMPENDEX Full-text
- TITLE: Characterization of all-solid-state thin film batteries (TFBS).
- AUTHOR: Moon, Hee-Soo (Division of Materials Science and Engineering Hanyang University, Seongdong-gu, Seoul, 133-791, South Korea); Kim, Young-Jae; Kim, Jung-Nam; Park, Jong-Wan
- MEETING TITLE: 2004 Joint International Meeting - 206th Meeting of the Electrochemical Society/2004 Fall Meeting of the Electrochemical Society of Japan, .
- MEETING LOCATION: Honolulu, HI, United States
- MEETING DATE: 03 Oct 2004-08 Oct 2004
- SOURCE: Meeting Abstracts 2004.p 126
- SOURCE: Meeting Abstracts 2004.p 126
- SOURCE: 2004 Joint International Meeting - 206th Meeting of the Electrochemical Society/2004 Fall Meeting of the Electrochemical Society of Japan, MA 2004-02
- ISSN: 1091-8213
- PUBLICATION YEAR: 2004
- MEETING NUMBER: 65239
- DOCUMENT TYPE: Conference Article
- TREATMENT CODE: Experimental
- LANGUAGE: English
- AN 2005(30):9445 COMPENDEX Full-text
- AB Demand for low power, battery operated devices is on the rise, particularly in portable equipment needing longer operation with higher reliability. Advances in the microelectronics industry and the miniaturization of electronic devices have reduced the current and power requirements of some of these devices to extremely low levels. This has made possible the use of thin film batteries (TBFs) as power sources for these devices. Therefore, it. is important to develop long lasting and high-energy efficient TFBs, which can be as an integral part of microelectronic circuits. TFBs made with solid-state thin film components can realize an appropriate capacity by adjusting thickness and deposition area. With using solid -state electrolytes, such as LIPON and polymer electrolyte, TFBs can be relatively free from the problems of bulk-type secondary batteries. Typical structure of TFBs is multilevel thin films

consisting sequentially of **current collector**/cathode/ solid electrolyte/**anode**/**current collector**/protective layer (Fig.1 and Fig.2). These thin films are deposited by chemical vapor deposition (CVD) or physical vapor deposition (PVD) methods utilizing microelectronic technologies. In this work, we fabricated TFBs using rf magnetron sputter, E-beam evaporator and doctor-blade method. Lithium manganese oxide, LIPON (or solid polymer electrolyte, P(EO)10LiTFSI+5 wt% R812+6 wt% D4CN) and lithium metal were used as the cathode, solid electrolyte and **anode**, respectively. Pt-deposited TiO<sub>2</sub>/SiO<sub>2</sub>/Si wafer was used as substrate. The thickness of LIPON and SPE was about 1.4 μm and 100 μm, respectively. Lithium metal was deposited on LIPON by thermal evaporator. When polymer electrolyte used, lithium metal and electrolyte stacked by mechanical pressing. **Surface roughness** and morphologies of the each film was measured by AFM and FE-SEM. The chemical bonding was analyzed by XPS. Cathode electrode was performed the half-cells test. In this test, we used 1 M solution of LiPF<sub>6</sub> in EC-DMC(1:1) as liquid electrolyte. Figure 3 showed discharge capacities of the TFBs we fabricated using solid polymer electrolyte. \$CPY 2004 The Electrochemical Society, Inc. 1 Refs.

AN 2005(30):9445 COMPENDEX Full-text  
 CC 714.2 Semiconductor Devices and Integrated Circuits; 702.1.2 Secondary Batteries; 525.2 Energy Conservation; 713 Electronic Circuits; 815.1.1 Organic Polymers; 817.1 Plastics Products  
 CT \*Thin film devices; Scanning electron microscopy; Polyelectrolytes; Chemical vapor deposition; Physical vapor deposition; **Surface roughness**; Atomic force microscopy; Secondary batteries; Energy efficiency; Microelectronics  
 ST Battery operated devices; Thin film batteries (TFB); Mechanical pressing; Power sources  
 ET P; F\*I\*Li\*S\*T; LiTFSI; Li cp; cp; T cp; F cp; S cp; I cp; C\*D\*N; D4CN; D cp; C cp; N cp; Pt; O\*Si\*Ti; O sy 3; sy 3; Si sy 3; Ti sy 3; TiO<sub>2</sub>/SiO<sub>2</sub>; Ti cp; O cp; Si cp; F\*Li\*P; LiPF<sub>6</sub>; P cp

L38 ANSWER 50 OF 63 COMPENDEX COPYRIGHT 2007 EEI on STN

ACCESSION NUMBER: 2003(28):2257 COMPENDEX Full-text  
 TITLE: Advanced structures in electrodeposited tin base negative electrodes for lithium secondary batteries.  
 AUTHOR: Tamura, Noriyuki (Sanyo Electric Company, Limited Energy Research and Development Ctr. Soft Energy Company, Nishi-ku, Kobe, Hyogo 651-2242, Japan); Ohshita, Ryuji; Fujimoto, Masahisa; Kamino, Maruo; Fujitani, Shin  
 SOURCE: Journal of the Electrochemical Society v 150 n 6 July 2003 2003.p A679-A683  
 SOURCE: Journal of the Electrochemical Society v 150 n.6 July 2003 2003.p A679-A683  
 CODEN: JESOAN ISSN: 0013-4651  
 PUBLICATION YEAR: 2003  
 DOCUMENT TYPE: Journal  
 TREATMENT CODE: Experimental  
 LANGUAGE: English

AN 2003(28):2257 COMPENDEX Full-text

AB Tin **anodes** deposited electrochemically on a copper foil **current collector** are studied to develop a next-generation lithium-ion battery with higher energy density. Better cycle performance through ten initial cycles under full charge and discharge conditions was attained by annealing tin electrodeposited on a **rough surface** copper foil. The annealing process was found to change the main active material from Sn to Cu<sub>6</sub>Sn<sub>5</sub> with some minor compounds. Furthermore, a microcolumnar structure of the active material portion was found to be self-organized in accordance with the surface profile of the foil during the first charge-discharge cycle. Advantages of these structural features are discussed

in terms of the initial charge and discharge performance, including specific capacity and coulombic efficiency measured by using a three-electrode cell. 27 Refs.

AN 2003(28):2257 COMPENDEX Full-text  
 CC 714.1 Electron Tubes; 546.2 Tin and Alloys; 539.3.1 Electroplating;  
 702.1.1 Primary Batteries; 537.1 Heat Treatment Processes; 535.1 Metal  
 Rolling  
 CT \***Anodes**; Lithium alloys; Crystal whiskers; Oxidation;  
 Surface treatment; Electric charge; Surface discharges; Tin;  
 Electrodeposition; Lithium batteries; Annealing; Metal foil;  
**Surface roughness**  
 ST **Negative electrode**; Tin **anode**; Lithium  
 secondary battery; Copper foil **current collector**;  
 Microcolumnar structure; Three electrode cell  
 ET Sn; Cu\*Sn; Cu sy 2; sy 2; Sn sy 2; Cu6Sn; Cu cp; cp; Sn cp

L38 ANSWER 51 OF 63 JAPIO (C) 2007 JPO on STN  
 ACCESSION NUMBER: 1999-329448 JAPIO Full-text  
 TITLE: NONAQUEOUS SECONDARY BATTERY POSITIVE ELECTRODE  
**CURRENT COLLECTOR** AND NONAQUEOUS  
 SECONDARY BATTERY HAVING THIS **CURRENT**  
**COLLECTOR**  
 INVENTOR: KAZUHARA MANABU; HIRATSUKA KAZUYA; IKEDA  
 KATSU HARU; KAWASATO TAKESHI; HIGUCHI YOSHI AKI  
 PATENT ASSIGNEE(S): ASAHI GLASS CO LTD  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 11329448	A	19991130	Heisei	H01M004-64

## APPLICATION INFORMATION

STN FORMAT: JP 1998-133845 19980515  
 ORIGINAL: JP10133845 Heisei  
 PRIORITY APPLN. INFO.: JP 1998-133845 19980515  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
 Applications, Vol. 1999

AN 1999-329448 JAPIO Full-text  
 AB PROBLEM TO BE SOLVED: To improve the charge and discharge cycle durability with good retainability of electrolyte and stability by integrating an aluminum foil having a **roughed surface** layer having a specified thickness on the surface and having a specified breaking energy to an electrode consisting of a positive electrode active material and a binder to form a positive electrode body.  
 SOLUTION: An aluminum foil having a **roughed surface** layer 1-5  $\mu\text{m}$  thick in average, desirably 2-4  $\mu\text{m}$  thick on the surface and having a breaking energy for No.1 dumbbell-like test piece regulated in JIS-K6301 of 3 kg.mm or more, desirably, 4-10 kg.mm is used. Further, this aluminum foil consists of an etched foil, and it has a loss by etching of a 1-8 g/m<sup>2</sup>, desirably, 3-5 g/m<sup>2</sup>. A positive electrode consisting of a positive electrode material and a binder is integrated with a **current collector** consisting of the aluminum foil to form a positive electrode body, and it is housed in a case together with a **negative electrode** body and a solution consisting of a lithium salt of solute and a nonaqueous solvent capable of dissolving the lithium salt to form a nonaqueous secondary battery.  
 COPYRIGHT: (C)1999, JPO  
 IC ICM H01M004-64  
 ICS H01M004-02; H01M004-62; H01M010-40  
 ICA C23F001-00

L38 ANSWER 52 OF 63 JAPIO (C) 2007 JPO on STN  
 ACCESSION NUMBER: 1999-297307 JAPIO Full-text  
 TITLE: POLYMER LITHIUM ION SECONDARY BATTERY  
 INVENTOR: NISHIHAMA HIDEKI; KUZE SADAMU; HIGAKI KATSUHIRO;  
 YOKOYAMA AKIMICHI; SUGIYAMA HIROSHI; KAWAI TETSUO  
 PATENT ASSIGNEE(S): HITACHI MAXELL LTD  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 11297307	A	19991029	Heisei	H01M004-02

## APPLICATION INFORMATION

STN FORMAT: JP 1998-94495 19980407  
 ORIGINAL: JP10094495 Heisei  
 PRIORITY APPLN. INFO.: JP 1998-94495 19980407  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
 Applications, Vol. 1999

AN 1999-297307 JAPIO Full-text

AB PROBLEM TO BE SOLVED: To make satisfactory applicability of a positive electrode mix and a **negative electrode** mix to a **current collector** and **current collectability** for making satisfactory battery performance. SOLUTION: An metal foil having 3  $\mu$ m or more for **surface roughness** Rz in conformance with JIS-C-0601 is used as a **current collector** for a positive electrode and a **negative electrode**, in a polymer lithium ion secondary battery having the sheet-like positive electrode formed with a gelled positive electrode mix layer at least on one face of the **current collector**, a sheet-like **negative electrode** formed with a gelled **negative electrode** mix layer at least on one face of the **current collector**, and a polymer electrolyte layer.

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IC ICM H01M004-02  
 ICS H01M004-64; H01M010-40

L38 ANSWER 53 OF 63 JAPIO (C) 2007 JPO on STN  
 ACCESSION NUMBER: 1999-195434 JAPIO Full-text  
 TITLE: NONAQUEOUS ELECTROLYTE SECONDARY BATTERY  
 INVENTOR: KOUZUKI KIYOMI; UEMOTO SEIICHI; FUJII TAKAFUMI  
 PATENT ASSIGNEE(S): MATSUSHITA ELECTRIC IND CO LTD  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 11195434	A	19990721	Heisei	H01M010-40

## APPLICATION INFORMATION

STN FORMAT: JP 1998-284902 19981007  
 ORIGINAL: JP10284902 Heisei  
 PRIORITY APPLN. INFO.: JP 1997-274118 19971007  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
 Applications, Vol. 1999

AN 1999-195434 JAPIO Full-text

AB PROBLEM TO BE SOLVED: To prevent the trouble in a connecting part and improve the vibration resistance by constituting, in the **current collecting** terminals of a positive electrode and a **negative electrode**, the part forming an external terminal protruded to the outside of a battery case and the part to which a lead plate brought out from an electrode plate group is connected by use of dissimilar metals, and integrating these metals by means of solid phase connection method. SOLUTION: In a positive electrode **current collecting** terminal, the aluminum part 21 electrically connected to a lead plate within a battery case and the stainless steel part 20 protruded out of the battery case



to be used also as an external terminal are put in a metal capsule after the connecting surfaces are polished to a **surface roughness** of 10  $\mu\text{m}$  or less, degassed and sealed. The connecting surfaces are laid in vacuum state, and the whole capsule is charged in an electric furnace and vacuumed while heating to 300 $^{\circ}\text{C}$ . Then, the capsule is charged in a HIP(hot isostatic pressing) device, and the temperature and the pressure are simultaneously raised to 1100 $^{\circ}\text{C}$  and 100 Pa over 4 hours, and reduced over 4 hours after held there for 4 hours. According to this, the breakage defective can be prevented.

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IC ICM H01M010-40  
ICS H01M002-22; H01M002-30

L38 ANSWER 54 OF 63 JAPIO (C) 2007 JPO on STN  
ACCESSION NUMBER: 1999-097034 JAPIO Full-text  
TITLE: ORGANIC ELECTROLYTE CELL  
INVENTOR: KIKUMA YUICHI; FUJITA KOJI; OYAMA AKIRA; OISHI HIROMI  
PATENT ASSIGNEE(S): TOSHIBA BATTERY CO LTD  
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 11097034	A	19990409	Heisei	H01M004-78

#### APPLICATION INFORMATION

STN FORMAT: JP 1997-256410 19970922  
ORIGINAL: JP09256410 Heisei  
PRIORITY APPLN. INFO.: JP 1997-256410 19970922  
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1999

AN 1999-097034 JAPIO Full-text

AB PROBLEM TO BE SOLVED: To enhance assembly operating performance and cell performance by thoroughly bonding the sheet shaped negative plate of an organic electrolyte cell with a **negative electrode current collector** with pressure. SOLUTION: In this organic electrolyte cell having a spiral shaped electrode groups 3 where a sheet shaped positive plate 4 and a sheet shaped negative plate 6 are wound around by way of a separator 12, a contact bonding surface brought into contact with the negative plate of a **negative electrode current collector** 7 electrically connecting the sheet shaped negative plate with a **negative electrode** terminal (outer packaging can) 1, is finished up in **surface roughness** to be equal to or more than 5  $\mu\text{m}$ . By this constitution, contact-bonding properties and processability are made excellent by a projection embossing process which is used to be applied to the **current collector** in the past, and contact resistance with the surface of a **negative electrode** can thereby be stabilized. COPYRIGHT: (C)1999,JPO

IC ICM H01M004-78  
ICS H01M004-64

L38 ANSWER 55 OF 63 JAPIO (C) 2007 JPO on STN  
ACCESSION NUMBER: 1996-064201 JAPIO Full-text  
TITLE: **NEGATIVE ELECTRODE FOR LITHIUM BATTERY AND MANUFACTURE THEREOF**  
INVENTOR: MIZUNO FUMIAKI; HANABUSA KOJI; MIYAI KIYOSHI; TADA TOSHIHARU  
PATENT ASSIGNEE(S): SUMITOMO ELECTRIC IND LTD  
KANSAI ELECTRIC POWER CO INC:THE  
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
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JP 08064201 A 19960308 Heisei H01M004-02

## APPLICATION INFORMATION

STN FORMAT: JP 1994-198288 19940823  
 ORIGINAL: JP06198288 Heisei  
 PRIORITY APPLN. INFO.: JP 1994-198288 19940823  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
 Applications, Vol. 1996

AN 1996-064201 JAPIO Full-text

AB PURPOSE: To provide a **negative electrode** for a lithium battery capable of suppressing a side reaction on the surface of a **current collector** and having a simple structure and a high electricity quantity density. CONSTITUTION: A metal foil 1 having the maximum **surface roughness** Rmax of 3 $\mu$ m or above and the center line average roughness Ra of 0.2 $\mu$ m or above is pressure-connected to carbon fibers 2 to form this **negative electrode** for a lithium battery. A diaphragm 5 containing an electrolyte is inserted between this **negative electrode** and a positive electrode 4 made of a lithium-aluminum alloy.  
 COPYRIGHT: (C)1996, JPO

IC ICM H01M004-02

ICS H01M004-04; H01M004-58; H01M004-64

L38 ANSWER 56 OF 63 JAPIO (C) 2007 JPO on STN

ACCESSION NUMBER: 1990-094257 JAPIO Full-text  
 TITLE: MANUFACTURE OF LEAD-ACID BATTERY  
 INVENTOR: INOUE TOSHIHIRO; KOBAYASHI KENJI  
 PATENT ASSIGNEE(S): MATSUSHITA ELECTRIC IND CO LTD  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 02094257	A	19900405	Heisei	H01M004-20

## APPLICATION INFORMATION

STN FORMAT: JP 1988-244925 19880929  
 ORIGINAL: JP63244925 Showa  
 PRIORITY APPLN. INFO.: JP 1988-244925 19880929  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
 Applications, Vol. 1990

AN 1990-094257 JAPIO Full-text

AB PURPOSE: To unify the liquid distribution in an electrode plate and improve the utilization factor by filling the paste mainly made of lead oxide, dilute sulfuric acid and water prior to aging and drying in a lattice body concurrently serving as a **current collecting** plate, spraying or wetting a dilute sulfuric acid aqueous solution with specified specific gravity while the paste has plasticity, and pressing it to smooth the surface.  
 CONSTITUTION: In a sealed type lead-acid battery, an electrolyte is contained in positive and **negative electrode** plates and a separator, and free electrolyte rarely exists. The electrode plate of such battery is manufactured as follows: The paste mainly made of lead oxide, dilute sulfuric acid and water is filled in a lattice body made of lead or plastic, then a dilute sulfuric acid aqueous solution with the specific gravity of 1.00-1.20 is sprayed or wetted on the electrode plate while the paste has plasticity prior to aging and drying, it is pressed with a flat plate or a roller, and the **surface roughness** of the electrode plate is set to 50 $\mu$ m or below. The group pressure of the battery is made constant, and the adhesion between the electrode plate and the separator is improved.  
 COPYRIGHT: (C)1990, JPO&Japio

IC ICM H01M004-20

L38 ANSWER 57 OF 63 JAPIO (C) 2007 JPO on STN

10/691,476

ACCESSION NUMBER: 1988-045755 JAPIO Full-text  
 TITLE: LAYER BUILT DRY CELL  
 INVENTOR: OIKE KAZUO  
 PATENT ASSIGNEE(S): TOSHIBA BATTERY CO LTD  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 63045755	A	19880226	Showa	H01M004-64

APPLICATION INFORMATION

STN FORMAT: JP 1986-188573 19860813  
 ORIGINAL: JP61188573 Showa  
 PRIORITY APPLN. INFO.: JP 1986-188573 19860813  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1988

AN 1988-045755 JAPIO Full-text

AB PURPOSE: To increase adhesion of the surface of a conductive film to a positive mix by specifying the surface roughness of the conductive film of a combined electrode also serving as a **negative electrode** of a unit cell and/or the conductive film of a positive **current collector**.  
 CONSTITUTION: A combined electrode is produced by forming a conductive film 4 on one side of a zinc plate 1 by applying conductive paint or bonding a conductive film. Desired **surface roughness** is obtained by pressing the surface of the conductive film 4 with a mold having **rough surface**. The periphery of the conductive film of the combined electrode is coated with an adhesive 5, and the combined electrode is inserted in a heat-shrinkable resin tube 6, and one end of the resin tube 6 is made to shrink by heat to bond the resin tube to the conductive film 4 and to form a cell cup. A separator 2 and a positive mix pellet 3 are accommodated in the cell cup, then the opening of the resin tube 6 is made to shrink to form a unit cell 11. The **surface roughness** of conductive films of the combined electrode and a positive **current collector** is specified to  $10 \sim 200 \mu\text{m}$ . Thereby, adhesion of the conductive film to the positive mix is made good. COPYRIGHT: (C)1988, JPO&Japio

IC ICM H01M004-64  
 ICS H01M004-70

L38 ANSWER 58 OF 63 JAPIO (C) 2007 JPO on STN

ACCESSION NUMBER: 1982-202060 JAPIO Full-text  
 TITLE: ORGANIC SOLVENT CELL  
 INVENTOR: OIZUMI MASATOSHI; NAKAMURA NAONOBU; WAKIZAKA TOSHIO; TANAKA KOICHI  
 PATENT ASSIGNEE(S): TOSHIBA BATTERY CO LTD  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 57202060	A	19821210	Showa	H01M002-20

APPLICATION INFORMATION

STN FORMAT: JP 1981-86557 19810605  
 ORIGINAL: JP56086557 Showa  
 PRIORITY APPLN. INFO.: JP 1981-86557 19810605  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1982

AN 1982-202060 JAPIO Full-text

AB PURPOSE: To obtain an organic solvent cell with no **current collector**, the excellent operability, a small internal resistance, and a large capacity by spraying hard particles on a sealing plate or the inside of a cell container at a high pressure so as to form sharp pits and spikes and by pressing a

positive electrode and a **negative electrode** together. CONSTITUTION: A positive electrode 1 is molded by pressure in a disk shape after adding a conductive agent and a binding agent to a positive electrode material made of manganese dioxide burned at 350deg;C. Silicon carbide particles with particle sizes of 400 $\mu$ m;1,000 $\mu$ m; are sprayed at a high pressure by use of compressed air on the inner face of a cell container made of stainless steel and concurrently acting as the positive terminal in contact with the positive electrode 1 so as to form sharp pits and spikes 3 with **surface roughness** of 2 $\mu$ m;20 $\mu$ m;, then the particles are removed and the positive electrode 1 is filled. The pits and spikes 3 bite into the **negative electrode** 5 and the positive electrode 1 so that the resistance film of the **negative electrode** surface is broken and the real surface is brought into direct contact and the contact areas are also enlarged, thereby the resistance is reduced and the **current collecting** effect is improved.

COPYRIGHT: (C)1982,JPO&Japio

IC ICM H01M002-20

L38 ANSWER 59 OF 63 JAPIO (C) 2007 JPO on STN  
 ACCESSION NUMBER: 2005-135826 JAPIO Full-text  
 TITLE: NONAQUEOUS ELECTROLYTE SECONDARY BATTERY  
 INVENTOR: HATANAKA CHIZURU; SATO ASAKO; MATSUMOTO KOICHI;  
 ENDO SHOTA; SATO KAZUYA  
 PATENT ASSIGNEE(S): TOSHIBA CORP  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2005135826	A	20050526	Heisei	H01M004-66

#### APPLICATION INFORMATION

STN FORMAT: JP 2003-372449 20031031  
 ORIGINAL: JP2003372449 Heisei  
 PRIORITY APPLN. INFO.: JP 2003-372449 20031031  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
 Applications, Vol. 2005

AN 2005-135826 JAPIO Full-text

AB PROBLEM TO BE SOLVED: To provide a nonaqueous electrolyte secondary battery with high capacity and a long charging/discharging cycle life at high temperature.

SOLUTION: The nonaqueous electrolyte secondary battery comprises a positive electrode 6, a **negative electrode** 4, and nonaqueous electrolyte. The **negative electrode** has a **current collector** made of copper foil with a ten-point average **surface roughness** R<sub>SB</sub> of 1 to 2  $\mu$ m and a thickness of 6 to 12  $\mu$ m.

COPYRIGHT: (C)2005,JPO&NCIPI

IC ICM H01M004-66

ICS H01M004-02; H01M004-62; H01M004-64; H01M010-40

L38 ANSWER 60 OF 63 JAPIO (C) 2007 JPO on STN  
 ACCESSION NUMBER: 2003-223899 JAPIO Full-text  
 TITLE: MANUFACTURING METHOD OF **NEGATIVE ELECTRODE** PLATE AND LITHIUM SECONDARY BATTERY USING THE **NEGATIVE ELECTRODE** PLATE  
 INVENTOR: OSHIMA KENICHI; ITO HIROBUMI; FUKUHARA KOHEI  
 PATENT ASSIGNEE(S): MATSUSHITA ELECTRIC IND CO LTD  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2003223899	A	20030808	Heisei	H01M004-66

## APPLICATION INFORMATION

STN FORMAT: JP 2002-23029 20020131  
 ORIGINAL: JP2002023029 Heisei  
 PRIORITY APPLN. INFO.: JP 2002-23029 20020131  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
 Applications, Vol. 2003

AN 2003-223899 JAPIO Full-text

AB PROBLEM TO BE SOLVED: To provide a **negative electrode** plate which has adhesion between a **negative electrode current collector** and a **negative electrode mix layer** and is not peeled off even if a coating start edge section of the **negative electrode mix layer** is in touch with an exposed section of the **negative electrode current collector**, and to provide a lithium secondary battery using the **negative electrode plate**.

SOLUTION: After a **negative electrode paste-like mixture** is intermittently coated, dried and extended by applying pressure on both surfaces of a copper foil having an average **surface roughness** Ra of 0.15-0.40  $\mu\text{m}$  for a **current collector**, a hoop cut into predetermined widths is wound around a reel and heated at a higher temperature than softening points of a binder and/or a thickener in the **negative electrode mix layer**. COPYRIGHT: (C)2003,JPO

IC ICM H01M004-66

ICS H01M004-02; H01M004-04; H01M010-40

L38 ANSWER 61 OF 63 JAPIO (C) 2007 JPO on STN

ACCESSION NUMBER: 2002-157996 JAPIO Full-text

TITLE: **NEGATIVE ELECTRODE AND BATTERY**  
 USING IT

INVENTOR: AKASHI HIROYUKI

PATENT ASSIGNEE(S): SONY CORP

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002157996	A	20020531	Heisei	H01M004-02

## APPLICATION INFORMATION

STN FORMAT: JP 2000-396278 20001120  
 ORIGINAL: JP2000396278 Heisei  
 PRIORITY APPLN. INFO.: JP 2000-396278 20001120  
 SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
 Applications, Vol. 2002

AN 2002-157996 JAPIO Full-text

AB PROBLEM TO BE SOLVED: To provide a **negative electrode** capable of improving anti-separation strength of a **negative electrode current collector** and a **negative electrode mix layer**, and a battery using this **negative electrode**.

SOLUTION: Belt-like positive electrode 21 and **negative electrode 22** have a winding electrode body wound via a separator 23. Lithium metal deposits on the **negative electrode 22** in the middle of charging, and capacity of the **negative electrode 22** is expressed by the sum of a capacitive component by storage-release of lithium and a capacitive component by deposit-dissolution of the lithium metal. **Roughened surface** work is applied to the **negative electrode current collector 22a**, and anti-separation strength of a **negative electrode current collector layer 22b** is improved thereby. Thus, even if the lithium metal deposits on a surface of a **negative electrode material**, separation of the **negative electrode mix layer 22b** is prevented, and a cycle characteristic is improved. **Surface roughness** of the **negative electrode current collector 22a** is

desirably 0.1  $\mu\text{m}$  or more, and the thickness of a flat part of the **negative electrode current collector** 22a is desirably 5  $\mu\text{m}$  or more.

COPYRIGHT: (C)2002,JPO

IC ICM H01M004-02

ICS H01M004-58; H01M004-66; H01M010-40

L38 ANSWER 62 OF 63 JAPIO (C) 2007 JPO on STN

ACCESSION NUMBER: 2000-294251 JAPIO Full-text

TITLE: COPPER MATERIAL FOR **NEGATIVE ELECTRODE CURRENT COLLECTOR** OF Li ION BATTERY AND MANUFACTURE THEREFOR

INVENTOR: OZAKI TOSHINORI; KODAIRA MUNEO

PATENT ASSIGNEE(S): HITACHI CABLE LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2000294251	A	20001020	Heisei	H01M004-66

#### APPLICATION INFORMATION

STN FORMAT: JP 1999-98976 19990406

ORIGINAL: JP11098976 Heisei

PRIORITY APPLN. INFO.: JP 1999-98976 19990406

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2000

AN 2000-294251 JAPIO Full-text

AB PROBLEM TO BE SOLVED: To improve adhesion to a carbon layer by providing specific average **surface roughness** for copper foil, and adhering a carbonaceous grain layer having a specific thickness composed of a carbonaceous grain having the specific particle size to a surface. SOLUTION: Copper foil has average **surface roughness** of 0.01 to 5  $\mu\text{m}$ , and a carbonaceous grain layer having a thickness of 0.01 to 300  $\mu\text{m}$  composed of a carbonaceous grain having the particle size of 0.001 to 30  $\mu\text{m}$  is adhered to the surface. Such a carbonaceous grain layer is formed on the copper foil by putting the copper foil having the **surface roughness** in a high temperature nonoxidizing atmosphere together with an organic substance. In that case, a liquid material such as polybutene used as working oil when manufacturing the copper foil, powder such as a polystyrene resin and even gas such as hydrocarbon such as hexane or organometal such as Cu carbonyl can be used as the organic substance. A material having a thickness of 5 to 50  $\mu\text{m}$  is suitably used as the copper foil. COPYRIGHT: (C)2000,JPO

IC ICM H01M004-66

ICS H01M004-02

L38 ANSWER 63 OF 63 JAPIO (C) 2007 JPO on STN

ACCESSION NUMBER: 2000-149928 JAPIO Full-text

TITLE: MANUFACTURE OF NONAQUEOUS ELECTROLYTE SECONDARY BATTERY

INVENTOR: TAKAMORI MASAYUKI

PATENT ASSIGNEE(S): JAPAN ENERGY CORP

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2000149928	A	20000530	Heisei	H01M004-04

#### APPLICATION INFORMATION

STN FORMAT: JP 1998-314535 19981105

ORIGINAL: JP10314535 Heisei

PRIORITY APPLN. INFO.: JP 1998-314535 19981105  
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
Applications, Vol. 2000

AN 2000-149928 JAPIO Full-text

AB PROBLEM TO BE SOLVED: To suppress elongation of a positive electrode film and a **negative electrode** film generating when the positive electrode film and the **negative electrode** film are laminated on **current collector** foil (or a carrier film). SOLUTION: This manufacturing method of a nonaqueous electrolyte secondary battery contains a process in which a positive electrode film and a **negative electrode** film are laminated on a carrier material to which roughness work is applied. As the carrier material, positive and negative **current collector** foil or a plastic film is used. As the positive and negative **current collectors**, a material having a center line average height of 0.05-10  $\mu\text{m}$ , a glossiness at 60 $^\circ$  of 0.1-90% is preferably used, or as the plastic film, a material having a center line average height of 0.1-1.0  $\mu\text{m}$ , a glossiness at 60 $^\circ$  of 0.5-140% is preferably used. **Surface roughness** work is conducted by sandblast for example. As the negative **current collector**, use of electrolytic copper foil is preferable. COPYRIGHT: (C)2000,JPO

IC ICM H01M004-04

ICS H01M004-64; H01M010-40

=> d his nofile

(FILE 'HOME' ENTERED AT 09:23:50 ON 28 JUN 2007)

FILE 'HCAPLUS' ENTERED AT 09:29:27 ON 28 JUN 2007

L1 1 SEA ABB=ON PLU=ON US20050238956/PN  
SEL RN

FILE 'REGISTRY' ENTERED AT 09:29:50 ON 28 JUN 2007

L2 9 SEA ABB=ON PLU=ON (12401-74-0/BI OR 12597-68-1/BI OR  
63143-57-7/BI OR 7439-89-6/BI OR 7439-93-2/BI OR 7440-02-0/  
BI OR 7440-50-8/BI OR 74432-42-1/BI OR 7704-34-9/BI)  
L3 1 SEA ABB=ON PLU=ON LITHIUM/CN

FILE 'HCAPLUS' ENTERED AT 09:58:11 ON 28 JUN 2007

L4 336752 SEA ABB=ON PLU=ON L3 OR LITHIUM#  
E BATTERY ANODES/CT  
L5 18585 SEA ABB=ON PLU=ON "BATTERY ANODES"+PFT,NT/CT  
L6 173255 SEA ABB=ON PLU=ON ANODE# OR NEGATIVE ELECTROD#  
L7 QUE ABB=ON PLU=ON L5 OR L6  
L8 3033 SEA ABB=ON PLU=ON L7 AND CURRENT COLLECT?  
L9 1450 SEA ABB=ON PLU=ON L8 AND L4  
L10 35 SEA ABB=ON PLU=ON L9 AND SURFACE(2A)ROUGH?  
E SURFACE ROUGHNESS/CT  
L11 33020 SEA ABB=ON PLU=ON "SURFACE ROUGHNESS"+PFT,NT/CT  
L12 14 SEA ABB=ON PLU=ON L9 AND L11  
L13 35 SEA ABB=ON PLU=ON L10 OR L12  
L14 1 SEA ABB=ON PLU=ON L13 AND TAB#  
L15 27 SEA ABB=ON PLU=ON L9 AND TAB#  
L16 QUE ABB=ON PLU=ON MU OR MICRON OR MICROMETER OR  
MICRO(W)METER OR NANOMETER OR NANO(W)METER OR NM  
L17 0 SEA ABB=ON PLU=ON L15 AND L16  
L18 13 SEA ABB=ON PLU=ON L10 AND L16  
L19 2386 SEA ABB=ON PLU=ON L7 AND ANODE(2A)COLLECT?  
L20 36 SEA ABB=ON PLU=ON L19 AND (L11 OR SURFACE(2A)ROUGH?)  
L21 23 SEA ABB=ON PLU=ON L20 AND L16  
L22 29 SEA ABB=ON PLU=ON L18 OR L21

FILE 'WPIX' ENTERED AT 10:13:05 ON 28 JUN 2007

L23 130075 SEA ABB=ON PLU=ON ANODE# OR NEGATIVE ELECTROD# OR  
ANODE#(2A)BATTER?  
L24 9655 SEA ABB=ON PLU=ON CURRENT COLLECT? OR ANODE# COLLECT?  
L25 3590 SEA ABB=ON PLU=ON L23 AND L24  
L26 35 SEA ABB=ON PLU=ON L25 AND SURFACE(2A)ROUGH?  
L27 19 SEA ABB=ON PLU=ON L26 AND L16  
L28 17 SEA ABB=ON PLU=ON L27 AND LITHIUM#

FILE 'COMPENDEX' ENTERED AT 10:16:08 ON 28 JUN 2007

L30 310 SEA ABB=ON PLU=ON L23 AND L24  
L31 6 SEA ABB=ON PLU=ON L30 AND SURFACE(2A)ROUGH?  
L32 1 SEA ABB=ON PLU=ON L31 AND L16  
L33 6 SEA ABB=ON PLU=ON L31 OR L32

FILE 'JAPIO' ENTERED AT 10:17:31 ON 28 JUN 2007

L34 26 SEA ABB=ON PLU=ON L30 AND SURFACE(2A)ROUGH?  
L35 13 SEA ABB=ON PLU=ON L34 AND L16



10/691,476

FILE 'PASCAL' ENTERED AT 10:17:58 ON 28 JUN 2007

L36 0 SEA ABB=ON PLU=ON L34 AND L16  
L37 2 SEA ABB=ON PLU=ON L30 AND SURFACE(2A)ROUGH?

FILE 'HCAPLUS, WPIX, COMPENDEX, JAPIO' ENTERED AT 10:25:58 ON 28 JUN  
2007

L38 63 DUP REM L22 L28 L33 L35 L36 (2 DUPLICATES REMOVED)  
ANSWERS '1-29' FROM FILE HCAPLUS  
ANSWERS '30-44' FROM FILE WPIX  
ANSWERS '45-50' FROM FILE COMPENDEX  
ANSWERS '51-63' FROM FILE JAPIO